

THE SCRIPTA MATHEMATICA STUDIES  
NUMBER THREE

# Mathematical Table Makers

By  
RAYMOND CLARE ARCHIBALD



MATHEMATICAL TABLE MAKERS







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NUMBER THREE

# Mathematical Table Makers

*Portraits, Paintings, Busts, Monuments*

*Bio-Bibliographical Notes*

BY

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## PREFACE

In the following pages is a revised, rearranged, and somewhat extended reprint of two articles appearing in *Scripta Mathematica* in 1946, together with three additional sketches and portraits. The Table Makers considered are as follows (a star indicating an accompanying portrait):


*Airey	Glaisher, J	Martin
Anding	*Glaisher, J. W. L.	*Miller
Babbage	Hoëne-Wroński	*Napier
Bauschinger	Hoppe	Nielsen
Becker	Hutton	*Pearson
Bessel	Jacobi	Peirce
Bierens de Haan	*Kepler	*Peters
Borda	*Kraitchik	Rivard
Brown	LaLande	Sang
Bürgi	*Legendre	Sharp
Burrau	*Lehmer, D. H.	Sheppard
Cohn	*Lehmer, D. N.	Stevin
*Comrie	Lodge	Stieltjes
*Cunningham	Lohse	*Tallqvist
Dase	Lommel	*Thompson
*Davis	*Lowan	Turner
*Dickson	Markov	*Uhler
*Dwight		Viète

I am greatly indebted to friends for certain illustrations in this compilation. Mrs. EUNICE LEHMER kindly loaned the cut of her husband, Professor D. N. LEHMER; Dr. COMRIE contributed the cut of the photograph taken in Hungary in 1930. Professor H. T. DAVIS most generously gave me copies of the photographs of GLAISHER, LEGENDRE, and TALLQVIST. Professor E. S. PEARSON and the Cambridge University Press graciously allowed me to reproduce the portrait of KARL PEARSON from his Biography, Miss A. M. CUNNINGHAM gave me for reproduction a prized portrait of her father, and The American Mathematical Society very courteously loaned its cut of L. E. DICKSON.

R. C. A.

BROWN UNIVERSITY, PROVIDENCE, R. I.





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## INTRODUCTION

THE fascination of a collection of portraits of mathematicians, astronomers, and mathematical physicists has aroused the acquisitive desires of more than one collector. At the Napier Tercentenary Exhibition at Edinburgh in 1914, there was the remarkable collection of several hundred portraits, in 9 volumes, assembled by the late W. W. ROUSE BALL (1850–1925). A complete list of these is given in E. M. HORSBURGH, *Handbook of the Tercentenary Exhibition*, 1914, p. 328–334. These are now available to scholars in the Library of Trinity College, Cambridge. Similarly in the Plimpton, Smith, and Dale Libraries, Columbia University, is the very remarkable collection of over 3000 portraits, made by DAVID EUGENE SMITH (1860–1944). Fine reproductions of 24 of these, with attractively printed descriptive matter by Professor Smith, were issued in two Portfolios, *Portraits of Eminent Mathematicians*, published by *Scripta Mathematica*, 1936–1938. Professor Smith also reproduced many of the portraits in his *History of Mathematics*, v. 1, 1923.

More extensive published portrait collections include the two volumes, *Porträtgalerie der Astronomischen Gesellschaft*, (1) Stockholm, 1904, with 296 portraits and biographies; (2) Budapest, 1931, with 334 portraits and biographies; 60 in the first volume appearing also, 27 years later, in the second. But larger portraits, with very much fuller accompanying biographical notes, are given in the admirable volume prepared by MARCEL RIESZ, *Acta Mathematica 1882–1912, Table Générale des Tomes 1–35*, Upsala and Stockholm, 1913. In another *Table Générale* for *Bibliotheca Mathematica, 1887–1896* there are 43 small portraits and brief biographical notes. We may finally list the collection of 17 portraits, biographical notes, and complete bibliographies, published in *Scripta Mathematica*, 1936, under the title “Opera juvenum Americae in scientia mathematica praestantium.”

The most remarkable catalogue of portraits of mathematicians, astronomers, and mathematical physicists that was ever assembled was the small section of the great manuscript Bibliography of Mathematics prepared by Georg Hermann Valentin (1848–1926), during upwards of 40 years, with the expenditure of many thousands of dollars. I inspected this catalogue at the Staatsbibliothek, Berlin, during Valentin’s life-time in 1926, and again in 1928, shortly before

I presented a paper concerning Valentin and his Bibliography at the International Congress of Mathematicians at Bologna, *Atti del Congresso Internazionale dei Matematici*, v. 6, 1928, p. 465–472. Whether this Bibliography, which belonged to the Berlin Academy of Sciences, and the Staatsbibliothek, is now any longer in existence seems highly doubtful. In 1928 I copied all the references in the Catalogue of Portraits for names beginning with the letters A–C. There are here references to 280 portraits, so that in the whole alphabet there must have been references to thousands of portraits.

In the present publication we present a selection of 53 Mathematical Table Makers whose portraits have been published, or are published herewith. In connection with each of these men we give:

- (1) The full name with inclusive dates, when dead, and a few biographical notes, more extended in some cases.
- (2) A list of references to the location of paintings, busts, or monuments, or to published reproductions of them or of photographs. Such reproductions are usually accompanied by biographical material. All references to such material will be grouped under the black-face letters **P** or **PB**—the latter being used only if at least one of the references contains biographical items. Twenty portraits of table makers appear in this booklet.
- (3) Under the black-face letter **B**, a selected list of references to biographical information unaccompanied by portraits.
- (4) Under the black-face letter **T**, a list of the published tables of the individual in question.

In the presentation it will be convenient to use abbreviations for referring to some of the sources mentioned above; thus:

- (a) BALL followed by one of the numbers 1 to 7, or the letter A or C.
- (b) *Porträtgalerie* 1904, *Porträtgalerie* 1931.
- (c) POGGENDORFF 1, 1863; or 2, 1863; or 3 [A–L], 1897; or 3 [M–Z], 1898; or 4, 1904; or 5 [A–K], 1925; or 5 [L–Z], 1926; or 6 [A–E], 1936; or 6 [F–K], 1937; or 6 [L–R], 1938; or 6 [S–Z], 1940.
- (d) VALENTIN Bibl.

Other abbreviations will be v. for volume(s), p. for page or pages, R.A.S. = Royal Astronomical So., *MTAC* = *Mathematical Tables and Other Aids to Computation*, BAASMTTC = British Association for the Advancement of Science, Mathematical Tables Committee, and ° before a title to show that the publication has not been personally inspected. When a facsimile of a work has been inspected there is no indication that the



original has not been seen. The symbol has not been placed before a number of titles under, for example, LALANDE T; but the reader will find a statement concerning exactly what works were inspected.

Since comparatively few references have not been verified it is hoped that the number of errors, even among so many references, may be small.

It may be added that the locations of several portraits listed here were discovered through the use of the remarkable volume of Library of Congress, *A.L.A. Portrait Index*, Washington, 1906.



## JOHN ROBINSON AIREY (1868–1937)

B. Leeds, England. Univ. London, B.Sc. (1894), D.Sc. (1915); St. John's College, Cambridge (1903–1906, B.A. 1906, M.A. 1910) as foundation scholar, first class honors in both parts of the natural science Tripos, and awarded the Wright Hocking and Hughes prizes, Sc.D. (1927); member of the Mathematical Tables Comm. of the British Assoc. (1911–37, secy. 1916–29); principal West Ham Technical Institute (1912–18); principal of City of Leeds Training College (1918–33); co-editor of *Phil. Mag.* (1933–37), and *Journal of Science*. His younger brother Sir EDWIN AIREY is head of a large firm of building contractors and engineers.

### PB

1. In 1933, on retiring from the principalship of Leeds Training College, he was presented by his old students with his portrait, which he gave to the College for hanging in the College Hall. The portrait was painted by HOWARD SOMERVILLE. The principal of the College reported that there was also a portrait of Airey in the booklet *Coming of Age Celebrations*, 1928.
2. *City of Leeds Training College. John R. Airey—Principal 1919–1933*, Leeds, 1937. Portrait (1932) and 6 p. Quotation: "This booklet is intended as a tribute of affectionate remembrance to one who presided over the College for nearly fifteen years." It contains a biographical sketch and an address by W. L. Schroeder at a memorial service.
3. See Plate (1932) as in no. 2.

### B

1. *Who's Who 1938*, London, 1937.
2. *Times*, London, 17 Sept., 1937, p. 14c.
3. L. J. COMRIE, *Nature*, v. 140, 1937, p. 796–797.
4. R.A.S., *Mo. Notices*, v. 98, 1938, p. 243–244.
5. *Who Was Who 1929–1940*, London, 1941; see *MTAC*, p. 29.

### T

1. "The roots of the Neumann and Bessel functions," *Phys. So. London, Proc.*, v. 23, 1911, p. 219–224.
2. "The vibrations of circular plates and their relation to Bessel functions," *idem*, v. 23, 1911, p. 225–232.
3. "The oscillations of chains and their relation to Bessel and Neumann functions," *Phil. Mag.*, s. 6, v. 21, 1911, p. 736–742.
4. "Tables of Neumann functions  $G_n(x)$  and  $Y_n(x)$ ," *Phil. Mag.*, s. 7, v. 22, 1911, p. 660–663. Also in B.A.A.S., *Report*, 1911, p. 75–78.
5. "The asymptotic expansions of Bessel and other functions," *Archiv Math. Phys.*, s. 3, v. 20, 1913, p. 243; v. 22, 1914, p. 223.
6. "The vibrations of cylinders and cylindrical shells," *Archiv Math. Phys.*, s. 3, v. 20, 1913, p. 291–294.



7. "Tables of the Neumann functions  $G_0(x)$  and  $G_1(x)$  or Bessel functions of the second kind," B.A.A.S., *Report*, 1913, p. 115-130.
8. "Tables of the Neumann functions or Bessel functions of the second kind," *Archiv Math. Phys.*, s. 3, v. 22, 1914, p. 32-43.
9. "Tables of Neumann functions  $Y_0(x)$  and  $Y_1(x)$  . . .," B.A.A.S., *Report*, 1914, p. 76-82.
10. "The Neumann G functions," B.A.A.S., *Report*, 1914, p. 83-86.
11. "The Bessel functions  $J_n(x)$ ," B.A.A.S., *Report*, 1915, p. 28-32.
12. "The Neumann functions  $G_0(x)$ ,  $G_1(x)$ ,  $Y_0(x)$ , and  $Y_1(x)$ ," B.A.A.S., *Report*, 1915, p. 32-33.
13. "The Neumann functions  $Y_n(x)$ ," B.A.A.S., *Report*, 1915, p. 33-36.
- 14<sub>1</sub>. "Tables of sines and cosines ( $\theta$  in radians)," B.A.A.S., *Report*, 1916, p. 59-87.
- 14<sub>2-3</sub>. BAASMTTC, *Mathematical Tables*, v. 1, London, 1931, 1946, p. 8-23.
15. "Subsidiary tables of  $\theta - \sin \theta$  and  $1 - \cos \theta$  from  $\theta = .00001$  radian to  $.00100$  radian," B.A.A.S., *Report*, 1916, p. 88-89.
16. "Bessel and Neumann functions of equal order and argument," B.A.A.S., *Report*, 1916, p. 93-96.
17. "Bessel and Neumann functions of equal order and argument," *Phil. Mag.*, s. 6, v. 31, 1916, p. 521, 523, 525, 527.
18. "The roots of Bessel and Neumann functions of high order," *Phil. Mag.*, s. 6, 32, 1916, p. 11-14.
19. "The numerical calculation of the roots of the Bessel function  $J_n(x)$  and its first derivative  $J'_n(x)$ ," *Phil. Mag.*, s. 6, v. 34, 1917, p. 193-195.
20. (with H. A. Webb) "The practical importance of the confluent hypergeometric function," *Phil. Mag.*, s. 6, v. 36, 1918, p. 137-141.
21. "The Lommel-Weber  $\Omega$  function and its application to the problem of electric waves on a thin anchor ring," R. So. London, *Proc.*, v. 94A, 1918, p. 312-314.
22. "The addition theorem of the Bessel functions of zero and unit orders," *Phil. Mag.*, s. 6, v. 36, 1918, p. 238-242.
23. "Zonal harmonics of high order in terms of Bessel functions," R. So. London, *Proc.*, v. 96A, 1919, p. 6-8.
24. "Bessel functions of small fractional order and their application to problems of elastic stability," *Phil. Mag.*, s. 6, v. 41, 1921, p. 201-205.
25. "Zeros of Bessel functions of high order," B.A.A.S., *Report*, 1922, p. 271-272.
- 26<sub>1</sub>. "Sines and cosines of angles in circular measure," B.A.A.S., *Report*, 1923, p. 288-289; 1924, p. 276-278; 1928, p. 306-307.
- 26<sub>2-3</sub>. Mostly in BAASMTTC, *Mathematical Tables*, v. 1, London, 1931, 1946, T. II, p. 3-7.
27. "Bessel and other related functions of equal order and argument," B.A.A.S., *Report*, 1923, p. 290-293.
28. "Lommel-Weber functions of zero and unit orders," B.A.A.S., *Report*, 1924, p. 279-287.
29. "Bessel-Clifford functions of zero and unit orders," B.A.A.S., *Report*, 1924, p. 287-295.
30. "Bessel functions of half-odd integral order," B.A.A.S., *Report*, 1925, p. 221-233.

31. "Bessel functions  $J_{\frac{1}{2}}(x)$  and  $J_{-\frac{1}{2}}(x)$ ," B.A.A.S., *Report*, 1925, p. 234-242.
32. "Lommel-Weber functions  $\Omega_{\frac{1}{2}}(x)$  and  $\Omega_{-\frac{1}{2}}(x)$ ," B.A.A.S., *Report*, 1925, p. 243-253.
33. "Fresnel's integrals,  $S(x)$  and  $C(x)$ ," B.A.A.S., *Report*, 1926, p. 273-275, 297.
34. "The confluent hypergeometric function  $M(\alpha \cdot \gamma \cdot x)$ ," B.A.A.S. *Report*, 1926, p. 279-294; 1927, p. 221-244.
- 35<sub>1</sub>. "Hyperbolic sines and cosines,  $\sinh x$  and  $\cosh x$ ," B.A.A.S., *Report*, 1926, p. 295-296.
- 35<sub>2-3</sub>. BAASMTTC, *Mathematical Tables*, v. 1, London, 1931, 1946, p. 30.
- 36<sub>1</sub>. "The exponential integral,  $Ei(\pm x)$ " and "The sine and cosine integrals,  $Si(x)$  and  $Ci(x)$ ," B.A.A.S., *Report*, 1927, p. 245-251; 1928, p. 317-318.
- 36<sub>2-3</sub>. BAASMTTC, *Mathematical Tables*, v. 1, 1931, 1946, T. VII, p. 32-39 (with R. A. Fisher).
37. "Zeros of Bessel functions of small fractional order," B.A.A.S., *Report*, 1927, p. 252-253.
38. "Zeros of ber, bei, and other functions," B.A.A.S., *Report*, 1927, p. 254f.
- 39<sub>1</sub>. "Hyperbolic sines and cosines,  $\sinh \pi x$  and  $\cosh \pi x$ ," B.A.A.S., *Report*, 1928, p. 308-316.
- 39<sub>2-3</sub>. BAASMTTC, *Mathematical Tables*, v. 1, London, 1931, 1946, p. 26-29.
40. "Bessel function derivative,  $\partial J_{\nu}(x)/\partial \nu$ ," B.A.A.S., *Report*, 1928, p. 319-323.
- 41<sub>1</sub>. "The probability integral  $\int_x^{\infty} e^{-\frac{1}{2}t^2} dt$  and its integrals," B.A.A.S., *Report*, 1928, p. 324-340.
- 41<sub>2</sub>. Reproduced and much expanded in BAASMTTC, *Mathematical Tables*, v. 1, 1931, 1946, T. XV, p. 60-72.
- 42<sub>1-2</sub>. "Hermitian probability functions," BAASMTTC, *Mathematical Tables*, v. 1, T. XV-XVI, p. 60-72, 1931, 1946.
43. "Toroidal functions and the complete elliptic integrals," *Phil. Mag.*, s. 7, v. 19, 1935, p. 180-187.
44. "Bessel functions of nearly equal order and argument," *Phil. Mag.*, s. 7, v. 19, 1935, p. 233-235.
45. "The Bessel function derivatives  $\partial J_{\nu}(x)/\partial \nu$  and  $\partial^2 J_{\nu}(x)/\partial \nu^2$ ," *Phil. Mag.*, s. 7, v. 19, 1935, p. 238-242.
46. "The circular and hyperbolic functions, argument  $x/\sqrt{2}$ ," *Phil. Mag.*, s. 7, v. 20, 1935, p. 721-731.
47. "The circular sine and cosine functions, argument  $\log_e x$ ," *Phil. Mag.*, s. 7, v. 20, 1935, p. 732-738.
48. "The 'converging factor' in asymptotic series and the calculation of Bessel, Laguerre and other functions," *Phil. Mag.*, s. 7, v. 24, 1937, p. 529, 532, 533, 540-551.
49. "The radiation integrals  $\int_0^{\infty} \frac{dx}{x^{\alpha}(e^x - 1)}$ ," *Phil. Mag.*, s. 7, v. 25, 1938, p. 277-281.

ERNST EMIL FERDINAND ANDING (1860- )

B. Seebergen, near Gotha, Germany. Professor Univ. Munich (1903-1905); director of the Astronomical Observatory at Gotha (1906-1934).



## PB

1. *Porträtgalerie* 1904 and 1931.

## B

1. POGGENDORFF 4, 1904; 5, 1925; 6, 1936.
2. *Reichshandbuch der deutschen Gesellschaft. Das Handbuch der Persönlichkeiten in Wort und Bild*, v. 1. Berlin, 1930.
3. *Degeners Wer ist's?*, tenth ed. Berlin, 1935.

## T

1. *Sechsstellige Tafeln der Besselschen Funktionen imaginären Argumentes*, Leipzig, 1911, iv, 72 p.

## CHARLES BABBAGE (1792–1871)

B. Totnes, Devonshire, England. Graduated Univ. Cambridge, Peterhouse, B.A. (1814), M.A. (1817) but before graduation joined with Herschel and Peacock in founding the Analytic Society (1812) for promoting “the principles of pure D-ism in opposition to the Dotage of the University,” and in publishing several books and memoirs; F.R.S. (1816); took a prominent part in founding the R. Astron. So. (1820), and the R. Statistical So. (1834); contributed notably to the founding of the Br. Ass. Adv. Sci. (1831, trustee 1832–1838); Lucasian prof. of math. at Univ. Cambridge (1829–1839) but neither gave lectures nor was in residence; partially constructed, with large government grants and expenditure of his own money, a difference engine (1812–1842), and an analytic engine.

## PB

1. *Mechanics Mag.*, London, v. 18, 1833, frontispiece, engraved from an original family painting by Roffe.
- 2<sub>1</sub>. °C. BABBAGE, *Über Maschinen- und Fabrikwesen*, 1833, portrait frontispiece.
- 2<sub>2</sub>. °C. BABBAGE, *Tratado de Mecanica Pratica e Economica Politica*, 1835, portrait frontispiece. The references nos. 2<sub>1</sub>–2<sub>2</sub> are taken from Valentin Bibl.; they are German and Italian translations of Babbage's outstanding work, *On the Economy of Machinery and Manufacture*, London, 1832.
3. *Illus. London News*, v. 59, 1871, p. 424; *Graphic*, v. 4, 1871, p. 495.
4. L. CUST, *National Portrait Gallery*, London, v. 2, 1902, p. 168–169; reproduction of a painting by Samuel Laurence, bequeathed to the Gallery in 1876.
5. D. GODDARD, *Eminent Engineers. Brief Biographies of Thirty-two of the Inventors and Engineers who did most to further mechanical progress*, New York, 1906, p. 240–254, portrait p. 240.
6. BALL, v. C, (a) newspaper reproduction of an oval line engraving 7 × 8 ins.; (b) engraving from an oval photograph of 1860, 5 × 6 ins., with engraved autograph.
7. *Modern Instruments and Methods of Calculation*, ed. by E. M. HORSBURGH, London, 1914, portrait facing p. 69, copy of 6 (b), reduced



- in size. Article by P. E. Ludgate "Automatic calculating machines," p. 124-127, refers to Babbage's machines.
8. D. BAXANDALL, *Catalogue of the Collections in the Science Museum, South Kensington, with Descriptive and Historical Notes and Illustrations. Mathematics I. Calculating Machines and Instruments*. London, 1926. "Difference and analytical engines of Babbage," p. 30-34 + plate of difference engine of Babbage. Models of the difference and analytic engines, and a photographic portrait of Babbage are in the Museum.

## B

1. POGGENDORFF 1, 1863; 3, 1897.
2. C. BABBAE, *Passages from the Life of a Philosopher*, London, 1864, xii, 496 p. Bibl. p. 493-496.
3. A. S[TRANGE], R.A.S., *Mo. Notices*, v. 32, 1872, p. 101-109.
4. Smithsonian Inst., *Report*, 1873, p. 162-183 by N. S. DODGE; p. 183-187 by A. QUETELET transl. from obituary in *Annuaire de l'Observatoire royal de Bruxelles* for 1873.
5. Amer. Acad. Arts. Sci., *Proc.*, v. 8, 1873, p. 455-458.
6. A. M. CLARKE, *Dict. Nat. Biog.*, v. 2, 1885.
7. W. W. R. BALL, *A History of the Study of Mathematics at Cambridge*, Cambridge, 1895, p. 125, etc.
8. *Scripta Mathematica*, v. 3, 1935, p. 266-267, 348.
9. Harvard Univ. Computation Laboratory, *Annals*, v. 1, *A Manual of Operation of the Automatic Sequence Controlled Calculator*, Cambridge, Mass., 1946, Babbage, with illustration of calculating wheels designed by him, p. 1-9. See *MATC*, v. 2, p. 237.

## T

- 1<sub>1</sub>. *Tables of Logarithms of the Natural Numbers, from 1 to 108000*. Stereotyped. London, Mawman, 1827, xx, 201 p.
- 1<sub>2</sub>. Another printing, London, Fellowes, 1829.
- 1<sub>3</sub>. Stereotyped second ed., London, Fellowes, 1831.
- 1<sub>4</sub>. Stereotyped, third ed., London, Fellowes, 1834.
- 1<sub>5</sub>. Stereotyped, fourth impression, London, Murray, 1844.
- 1<sub>6,7</sub>. Other eds., or impressions, London, 1872, 1889.
- 1<sub>8</sub>. Stereotyped ed., new impression, London, Spon, 1915.
- 1<sub>9</sub>. German ed.: *Logarithmen der natürlichen Zahlen 1 bis 108000. Dritte stereotyp.—Aufl., besorgt und mit der Einleitung in deutscher Sprache herausg. von K. NAGY*, London, printed for Ung. Akademie d. Wiss., Clowes, 1834. The British Museum copy contains also the title page, author's preface, and introduction, in English, from the English edition, and the preface and introduction from K. Nagy's Hungarian ed. Printed on green paper.
- 1<sub>10</sub>. Hungarian ed.: *A' Természetes Számok' Logarithmai 1 töl 108000 ig. Stereotyp-harmadik kiadás. Készült Nagy Karoly'*. London, printed for Magyar tudós Társ., Clowes, 1834. xiv, xx, 201 p. The British Museum copy contains also the title page, author's preface, and introduction, in English, from the English edition. Printed on buff paper.

For various copies of these tables in different colored paper and ink see British Astron. Asso., *J.*, v. 44, 1934, p. 321; *Catalogue of the Crawford Library of the Royal Observatory, Edinburgh*, 1890, p. 32; Babbage, *Passages from the Life of a Philosopher*, p. 494–495; *Scripta Math.*, v. 3, 1935, p. 281–282.

- 2<sub>1</sub>. *A Comparative View of the Various Institutions for the Assurance of Lives*, with tables, London, 1826, xxxi, 170 p. Mortality table (see C. WALFORD, *The Insurance Cyclopaedia*, v. 3, 1874, p. 10f.).
- 2<sub>2</sub>. °German ed.: *Vergleichende Darstellung der verschiedenen Lebens-Assecuranz-Gesellschaften*, Weimar, 1827.

### JULIUS BAUSCHINGER (1860–1934)

B. Fürth, Germany. Professor and director of the Astronomisches Rechen-Institut in Berlin (1896–1909); prof. and director of the Astronomical Observatory Univ. Strassburg (1909–1918); and at Univ. Leipzig (1920–1930); author of the classical work *Die Bahnbestimmung der Himmelskörper* (Leipzig, 1906; second ed. 1928).

#### PB

1. *Porträtgalerie* 1904 and 1931.
2. G. STRACKE, *Astr. Gesell., Vierteljahrs.*, v. 69, 1934, p. 146–163 + portrait plate.
3. *Reichshandbuch der deutschen Gesellschaft. Das Handbuch der Persönlichkeiten in Wort und Bild*, Berlin, 1930, v. 1, p. 79.

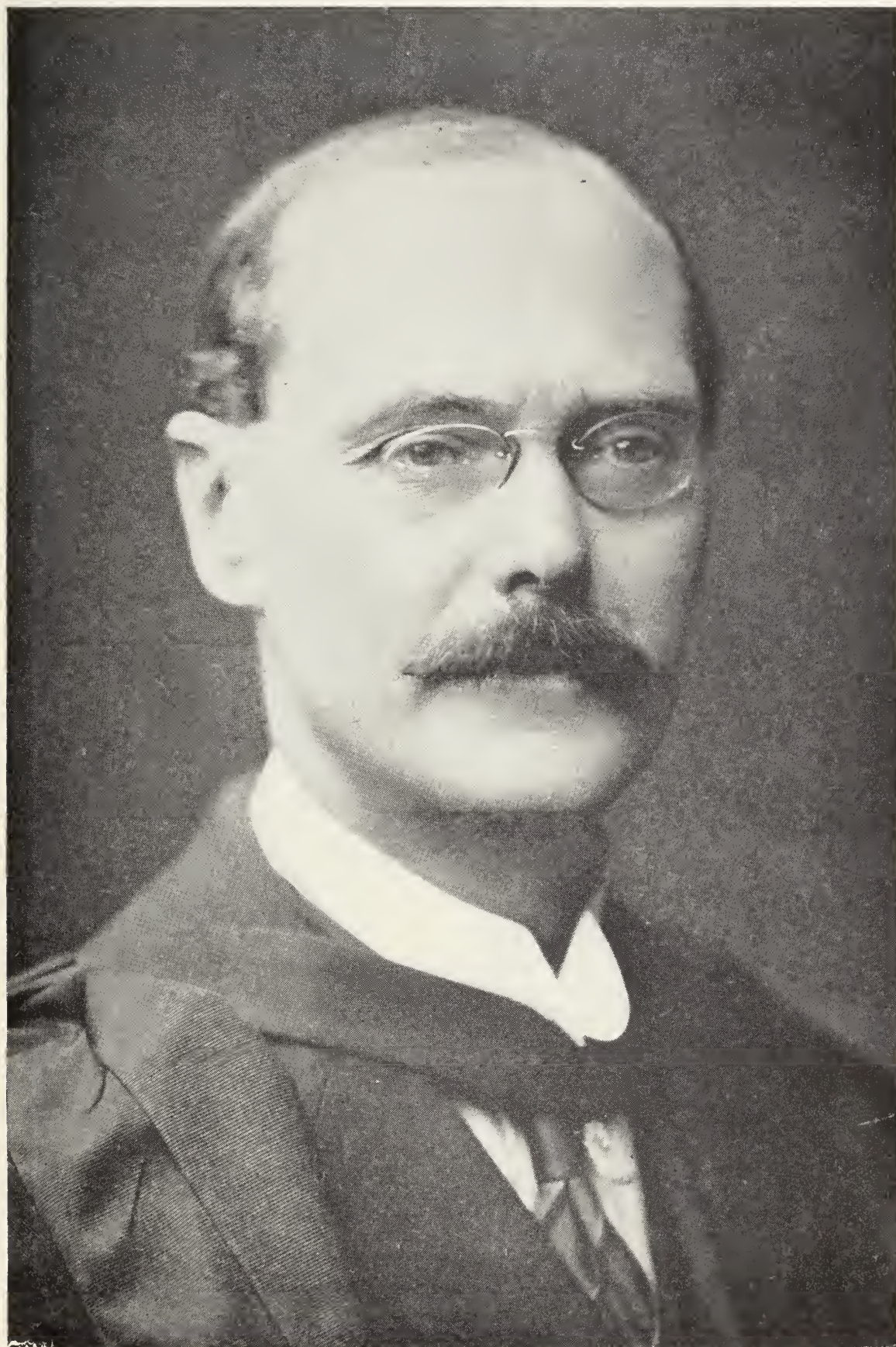
#### B

1. POGGENDORFF 4, 1904; 5, 1925; 6, 1936.
2. A. KOPFF, "Julius Bauschinger zum 70. Geburtstage," *Forschung u Fortschritte*, v. 6, 1930, p. 47–48.
3. *Astr. So. Pacific, Publs.*, v. 46, 1934, p. 116.
4. *Scripta Mathematica*, v. 2, 1934, p. 363; v. 3, 1935, p. 83–84.
5. J. HOPMANN, *Sächs. Akad. d. Wiss. zu Leipzig, Berichte, math.-phys. Kl.*, v. 86, 1934, p. 299–306.
6. G. S[TRACKE], *R.A.S., Mo. Notices*, v. 95, 1935, p. 336–337.

#### T

- 1<sub>1</sub>. *Tafeln zur theoretischen Astronomie*. Leipzig, 1901.
- 1<sub>2</sub>. Second ed., Neubearbeitet, by G. STRACKE, Leipzig, Engelmann, 1934, v, 192 p.
- 2<sub>1</sub>. (with J. T. PETERS) *Logarithmisch-trigonometrische Tafeln mit acht Dezimalstellen enthaltend die Logarithmen aller Zahlen von 1 bis 200000 und die Logarithmen der trigonometrischen Funktionen für jede sexagesimalsekunde des Quadranten. Erster Band: Tafel der achtstelligen Logarithmen aller Zahlen von 1 bis 200000*, Leipzig, Engelmann, 1910, xx, 368 p. *Zweiter Band: Tafel der achtstelligen Logarithmen der trigonometrischen Funktionen für jede Sexagesimalsekunde des Quadranten*, Leipzig, 1911, ii, 952 p. Also English title-page.
- 2<sub>2</sub>. Second ed. revised: German and English t.p. *Logarithmic-trigonometrical Tables with eight Decimal Places containing the Logarithms*





J. R. AIREY 1932







L. J. COMRIE 1932







A. J. C. CUNNINGHAM 1926







H. T. DAVIS 1945





*of all Numbers from 1 to 200,000 . . .*, 2 v. Leipzig, 1936, xiv, xii, 367 p. + 954 p.

### ERNST EMIL HUGO BECKER (1843–1912)

B. Emmerich, Germany. Director of the Observatory, and prof. of astronomy Univ. Strassburg (1887–1909).

#### PB

1. *Porträtgalerie*, 1904.
2. E. JOST, *Astr. Gesell., Vierteljahrsch.*, v. 48, 1913, p. 2–12 + portrait plate.

#### B

1. POGGENDORFF 3, 1897; 4, 1904; 5, 1925.
2. W. VALENTINER, *Astr. Nach.*, v. 192, 1912, cols. 321–324.
3. *Who's Who in Germany. Wer ist's?*, fifth ed. Leipzig, 1911.

#### T

- 1<sub>1</sub>. *Logarithmisch-trigonometrisches Handbuch auf fünf Decimalen*. Leipzig, 1882, xvi, 104 p.
- 1<sub>2</sub>. Second stereotyped ed. 1897, xvi, 104 p.
- 1<sub>3-4</sub>. Third and fourth eds. 1910 and 1928.

### FRIEDRICH WILHELM BESSEL (1784–1846)

B. Minden, Germany. One of the greatest astronomers of the nineteenth century; director of the Observatory at Königsberg, and prof. astronomy at the University there. Elected corresp. member sect. astronomy, Acad. Sci., Institut de France (1816) and foreign associate (1840).

#### PB

1. F. W. BESSEL, *Abhandlungen . . .*, 3 v. Leipzig, 1875–76, frontispiece v. 1, and frontispiece v. 3 (portrait of 1839).
2. A. L. BUSCH, Königsberg, Universität, Sternwarte, *Astronomische Beobachtungen*, v. 27, 1856, p. V–X + portrait plate.
3. *Westermann's Monatshefte*, v. 2, 1857, p. 622–626, portrait in text; v. 22, 1867, sketch by I. H. v. MÄDLER, p. 605–619, portrait in text.
4. *Gaea*, Leipzig, v. 20, 1884, p. 513.
5. W. v. SEIDLITZ, *Allgemeines historisches Porträtwerk*, v. 5. Munich, 1889, pl. 93 and text. Portrait a drawing by H. J. HERTERICH in possession of Prof. C. F. W. Peters, at the time the v. was published
6. *Harpers Mag.*, v. 94, 1897, p. 541.
7. K. WERCKMEISTER, *Das neunzehnte Jahrhundert in Bildnissen*. Berlin, v. 1, 1898, p. 95–96 + pl. 84, after painting by WOLF, engraved by MANDEL.

8. P. J. MÖBIUS, *Ueber die Anlage zur Mathematik*, second enlarged and changed ed. Leipzig, 1907; two plates of Bessel, one a drawing, the other his mask.

## B

1. List of writings, in Königsberg, Universität, Sternwarte, *Astronom. Beobachtungen*, v. 24, 1848, p. XXI–XLV.
2. J. H. K. DURÈGE, *Bessels Leben und Wirken*. Zürich, 1861.
3. POGGENDORFF 1, 1863.
4. C. C. BRUHNS, *Allg. Deutsche Biographie*, v. 2. Leipzig, 1875, p. 558–569.
5. E. T. BELL, *The Development of Mathematics*, second ed. New York, 1945; various index references.

## T

- 1<sub>1</sub>. Table of  $Li(x)$ , *Königsberger Archiv f. Natw. u. Math.*, v. 1, 1812, p. 27–31; also 1810–1811 articles in *Monat. Corresp.*
- 1<sub>2</sub>. BESSEL *Abhandlungen*, v. 2, 1876; p. 327, 329, 338–339.
- 1<sub>3</sub>. J. GLAISHER *Factor Table of the Sixth Million*, 1883, p. 94.
- 2<sub>1</sub>. Table of  $(\ln 2)^n$ , *Königsberger Archiv*, v. 1, p. 30.
- 2<sub>2</sub>. *Abhandlungen*, v. 2, 1876, p. 339.
- 3<sub>1</sub>. Table of  $\log \{[1-H(x)]/H'(x)\}$ , *Fundamenta Astronomiae*, 1818, p. 36–37.
- 3<sub>2</sub>. *Abhandlungen*, v. 1, 1875, p. 250–251.
- 4<sub>1</sub>. “Untersuchungen des Theils der planetarischen Störungen, welcher aus der Bewegung der Sonne entsteht,” Akad. d. Wissen., Berlin, *Math. Kl., Abh. . . . aus dem Jahre 1824*, Berlin, 1826, Table of Bessel functions, p. 46–52.
- 4<sub>2</sub>. Also in F. W. BESSEL, *Abhandlungen*, v. 1, 1875, p. 103–109. See *MTAC*, v. 1, p. 281.

## DAVID BIERENS DE HAAN (1822–1895)

B. Amsterdam, Holland. Prof. math. Univ. Leiden (1866–1892), prof emeritus 1892–1895. Secretary of the Amsterdam Math. So. (1875–1895) and editor of its *Nieuw Archief voor Wiskunde* (1875–1895); this Society had a continuous existence from 1778. Noted bibliographer and historian of Dutch mathematical works; for example, he is the author of: (a) *Bibliographie Néerlandaise Historique-Scientifique des Ouvrages Importants dont les auteurs sont nés aux 16<sup>e</sup>, 17<sup>e</sup>, et 18<sup>e</sup> siècles, sur les sciences mathématiques et physiques avec leurs applications*, Rome, 1883. 424 p. Reprinted from *Bull. di Bibl. e di Storia d. sc. mat. e. fisiche*, v. 14–16, 1881–1883. (b) *Bouwstoffen voor de Geschiedenis der Wis- en Natuurkundige Wetenschappen in de Nederlanden*, 2 v. Privately reprinted, [Leyden], 1878, 1887. vi, 378, vi, 466 p.

## PB

1. *Bibliotheca Mathematica, General-Register . . .*, 1876–1896, ed. by G. Eneström, p. 4.
2. BALL, v. 1.



## B

1. J. C. KLUYVER, D. J. KORTEWEG, P. H. SCHOUTE, "David Bierens de Haan 1822-1895," *Nieuw Archief voor Wiskunde*, s. 2, v. 2, 1896, p. I-XXVIII, with a list of his publications (1847-1895). The statement of POGGENDORFF (no. 2) concerning this item, "mit Portr.," is incorrect.
2. POGGENDORFF 3, 1897; 4, 1904.
3. C. DE WAARD, *Nieuw Nederlandsch Biografisch Woordenboek*, v. 7. Leiden, 1927, cols. 512-513.
4. M. VAN HAAFTEN, *Het Wiskundig Genootschap, zijn oudste Geschiedenis, zijn Werkzaamheden en zijn Beteekenis voor het Verzekeringswezen*. Groningen, 1923; many references.

## T

1. "Tables d'intégrales définies," Akad. v. Wetens., Amsterdam, *Verhandelingen*, v. 4, 1858, xxxi, 572 p.; "Exposé de la théorie des propriétés, des formules de transformation et des méthodes d'évaluation des intégrales définies," *idem.*, v. 8, parts 1-2, 1860, p. 1-182, part 3, 1862, p. 183-702; "Supplement aux tables d'intégrales définies qui forment le tome 4 des Mémoires de l'Académie," *idem.*, v. 10, 1864, 92 p. In 1885 C. F. LINDMAN published "Observations sur les tables d'intégrales définies de M. Bierens de Haan" (Amsterdam, 1858), K. Svenska Vetenskaps Akad., *Bihang*, v. 10, no. 3, 268 p.
- 2<sub>1</sub>. *Nouvelles Tables d'Intégrales Définies*. Leyden, 1867, 732 p.
- 2<sub>2</sub>. Reprint, Tokyo, 1935.
- 2<sub>3</sub>. Offset print, corrected and with an English translation of the Introduction, New York, G. E. Stechert & Co., 1939, xviii, 716 p. In 1891 appeared C. F. Lindman, "Examen des Nouvelles Tables d'Intégrales Définies de M. Bierens de Haan, Amsterdam [*sic*], 1867," K. Vetenskaps Akad., *Handlingar*, v. 24, no. 5, Stockholm, 231 p. An offset print of this Lindman volume was made in 1944 by G. E. Stechert & Co., New York. See *MTAC*, v. 1, p. 321 f.
3. "Een aanhangsel tot de tafels van onbepaalde integralen," Akad. van Wetens., *Verhandelingen*, v. 22, 1883, 225 p.

## JEAN CHARLES BORDA (1733-1799)

B. Dax, France. Notable contributor to the arts of navigation and geodesy through theory and the perfection of instruments. Named to the Acad. Royale d. Sciences: adjoint geometer (1756), associate (1768), pensionnaire (1772), resident member of the section math., first class, of the Institut (1795), president of the class (1796).

## PB

1. E. JOUQUET, "Histoire des études hydrodynamiques en France," *Revue Scientifique*, v. 63, 1925, p. 348.
2. J. BOYER, "Le bicentenaire du chevalier Borda," *La Nature*, v. 61, 15 Aug. 1933, p. 186. Reproduces a photograph of a statue to Borda erected in 1891 at Dax, France.

## B

1. DELAMBRE'S preface, below T 1.
2. LEFÈVRE GUINEAU, Acad. d. Sciences, *Mémoires, Sci. Math. et Physiques*, Paris, v. 4, 1802, p. 89–104.
3. *Nouvelle Biographie Universelle*, v. 16. Paris, 1853, p. 678.
4. N. NIELSEN, *Géomètres Français sous la Révolution*. Copenhagen, 1929, p. 19–24, etc.
5. M. d'OCAGNE, *Hommes & Choses de Science. Propos Familiars*. Paris, 1930, p. 71–83.
6. ACADÉMIE DES SCIENCES, Paris, *Annuaire pour 1935*, v. 19.

## T

1. *Tables Trigonométriques Décimales ou Table des Logarithmes des Sinus, Sécantes et Tangentes, suivant la Division du Quart de Cercle en 100 Degrés, du Degré en 100 Minutes, et de la Minute en 100 Secondes; précédées de la Table des Logarithmes des Nombres . . . et de Plusieurs Tables subsidiaires, Calculées par JEAN CHARLES BORDA, revues, augmentées et publiées par J. B. J. DELAMBRE*. Paris, 1801. "Preface de l'éditeur," p. 39–115. See *MTAC*, v. 1, p. 35.

## ERNEST WILLIAM BROWN (1866–1938)

B. Hull, England. Professor mathematics Haverford College (1893–1907); prof. math. Yale Univ. (1907–1932); F.R.S. (1898) and its gold medallist (1914); recipient Bruce gold medal (1920); correspondent for sect. astronomy, Acad. Sci., Institut de France (1921); outstanding contributor to celestial mechanics, especially in lunar theory; musician.

## PB

1. *New York Times*, 24 July 1938, section 1, p. 29.
2. R. C. ARCHIBALD, *A Semicentennial History of the American Mathematical Society*, New York, 1938, p. 173–183 + portrait plate. Bibl.
3. F. SCHLESINGER, *Astrophysical J.*, v. 89, 1938, p. 152–155 + portrait plate.
4. W. J. ECKERT, *Pop. Astr.*, v. 47, 1939, p. 63–66 + portrait in text.
5. C. G. DARWIN, *Obituary Notices of Fellows of The Royal Society*, 1940, p. 19–22 + portrait plate.

## B

1. POGGENDORFF 4, 1904; 5, 1925; 6, 1936.
2. *Nat. Cycl. Amer. Biog.*, v. 15. New York, 1916.
3. *Who's Who 1938*. London, 1937; *Who was Who 1929–1940*. London, 1941.
4. D. BROUWER, *Science*, n.s., v. 88, 7 Oct. 1938, p. 316–318.
5. R. C. ARCHIBALD, Amer. Acad. Arts and Sci., *Proc.*, v. 74, 1940, p. 114.
6. *MTAC*, v. 1, 1943, p. 29.

## T

1. (with the assistance of H. B. HEDRICK) *Tables of the Motion of the Moon*. New Haven and London, 1919, 3 v. See *MTAC*, v.1, p. 194.



- 2<sub>1</sub>. (with DIRK BROUWER) *Tables for the Development of the Disturbing Function with Schedules for Harmonic Analysis*. Yale Univ. Observatory, *Trans.*, v. 6, part 5, 1932, vii, p. 73-157.
- 2<sub>2</sub>. Also as a bound v., Cambridge Univ. Press, 1933, vi p. + p. 73-157.

## JOOST BÜRGI (1552-1632)

B. Lichtensteig, Switzerland. From 1579 to 1603 he was Hofuhrmacher of Landgraf Wilhelm IV of Hessen; and Kammeruhrmacher of Kaiser Rudolf II (1604-1622), in Prague, where he was in personal contact with Kepler. Maker of astronomical instruments. The last years of his life were spent in Cassel.

**PB** See also *Addendum*, p. 82, of this book.

1. Naturf. Ges. in Zürich, *Vierteljahrschrift*, v. 38, 1893, p. 1-3 + portrait plate.
2. C. A. v. DRACH, "Jost Burgi, Kammeruhrmacher Kaiser Rudolf II. Beitrag zu seiner Lebensgeschichte und Nachrichten über Arbeiten desselben," *Jahrbuch d. kunsthistorischen Sammlung des allerhöchsten Kaiserhauses*, Vienna, v. 15, 1894, p. 15-44 + pl. 1; with portrait and facsimiles of his handwriting. This is by far the most elaborate and valuable survey of the life and work of Bürgi.
3. His statue, by Kissling, was erected at his birthplace in 1906.
4. See under KEPLER, **PB** 1-VI.

## B

1. ° GIESWALD, *Justus Byrg als Mathematiker und dessen Einleitung in seine Logarithmen (Bericht über die St. Johannis Schule)*, Danzig 1856, 36 p. The "gründlichem unterricht" referred to in the title of the table below was not published in the volume and first appeared in this publication of Gieswald. It was reprinted by Grunert in his *Archiv Math. Phys.* v. 26, 1856, p. 317-334.
2. R. WOLF, *Biographien zur Kulturgeschichte der Schweiz*, Zürich, v. 1, 1858, p. 57-80.
3. POGGENDORFF 1, 1863.
4. M. CANTOR, *Allg. Deutsche Biographie*, v. 3, Leipzig, 1876, p. 604-606.
5. R. WOLF, *Handbuch der Astronomie*, Zürich, 1890, p. 86-88, 173-175.
6. F. CAJORI, "Algebra in Napier's day and alleged prior inventions of logarithms," p. 93-109, and R. A. SAMPSON, "The discovery of logarithms by Jobst Buergi," p. 208-212 + plates, in *Napier Tercentenary Memorial Volume*, ed. by C. G. Knott, London, 1915. The plates, in two colors, contain facsimiles of the title page, and of a page of the tables in *Progress Tabulen*.
7. M. CANTOR, *Vorlesungen*, v. 2, second ed., 1900, p. 617-619, 643-646, 725-729.

## T

- ° *Arithmetische und Geometrische Progress Tabulen sambt gründlichem unterricht wie solche nützlich in allerley Rechnungen zugebrauchen und verstanden werden sol*, Prague, 1620. The only known copy of this work in 1914 was in the Dantzig Stadt-Bibliothek.

## CARL BURRAU (1867- )

B. Helsingör, Denmark. Astronomer and actuary, censor of astronomy in Univ. Copenhagen (1916- ); joint editor *Astron. Jahresb.* (1899-1918); director Kreds af Norske Forsikringsselskaber (1918-22); actuary Forsikringsraadet (1922-34).

## PB

1. *Porträtgalerie* 1904 and 1931.

## B

1. N. NIELSEN, *Matematiken i Danmark, 1801-1908*, Copenhagen, 1910.
2. POGGENDORFF 5, 1925; 6, 1936.
3. *Kraks Blaa Bog*. Copenhagen, 1944.

## T

1. *Tafeln der Funktionen Cosinus und Sinus mit den natürlichen sowohl reellen als rein imaginären Zahlen als Argument (Kreis- und Hyperbelfunctionen)*, Berlin, 1907.

## BERTHOLD COHN (1870-1930)

B. Rawitsch, Germany. Astronomical observer, Univ. Strassburg.

## PB

1. *Porträtgalerie* 1904.

## B

1. B. COHN, "Lebenslauf" in diss. Strassburg, *Ueber die Gauss'sche Methode aus den Beobachtungen dreier gleichen Sternhöhen...*, 1897.
2. POGGENDORFF 5, 1925; 6, 1936.
3. Astr. Gesell., *Vierteljahrschrift*, v. 65, 1930. p. 221.

## T

1. *Tafeln der Additions- und Subtraktions-Logarithmen auf sechs Dezimalen*. Leipzig, 1909, iv, 63 p.
12. Second ed., edited by L. J. COMRIE: *Tables of Addition and Subtraction Logarithms with six Decimals*, London, Scientific Computing Service, 1939. viii, 63 p. See *MTAC*, v. 1, p. 112 f.

## LESLIE JOHN COMRIE (1893- )

B. Pukekohe, New Zealand. Auckland Univ. College B.A. (1915), M.A. (1916), senior univ. scholar and Sir George Grey scholar (1915); New Zealand Expeditionary Force scholar (1919-1922); Isaac Newton student, Univ. Cambridge (1920-1923, Ph.D.); assist. prof. math. and astron., Swarthmore College, U.S.A. (1922-24); assist. prof. astron. Northwestern Univ., Evanston, Ill. (1924-25); H. M. Nautical Almanac Office, deputy supt. (1925-30), supt. (1930-36); Math. Tables Comm. of the British Assoc. secy. (1929-36); pres. Intern. Astron. Union, Comm. on Ephemerides (1932-38). Managing director, Scientific Computing Service Ltd., London, England (1938- ).



## P

1. *Porträtgalerie* 1931.
2. See Plate, group picture of J. PETERS, L. J. C., and K. H. W. KRUSE of the Hamburg Observatory, taken in 1930 on Lake Balaton, Hungary when T 10 was first planned. Also, separate portrait-plate of L. J. C. (1932).

## B

1. POGGENDORFF 6, 1936.
2. *Who's Who in New Zealand . . .*, fourth ed., Wellington, N. Z., 1941.
3. *Who's Who* 1945, London, 1944.

## T

1. "Tables for interpolation to tenths and fifths by the end-figure process," Appendix to the *Nautical Almanac for 1931*, London, 1929.
- 2<sub>1</sub>. *Barlow's Tables of Squares, Cubes, Square Roots, Cube Roots and Reciprocals of all Integer numbers up to 10,000*. Third ed., edited by L. J. C., London, Spon, 1930. xii, 208 p.
- 2<sub>2</sub>. *Barlow's Tables of Squares, Cubes, Square Roots, Cube Roots and Reciprocals of all Integer numbers up to 12,500*. Fourth ed., edited by L. J. C., London, Spon, 1941. xii, 258 p.
- 3<sub>1-2</sub>. (with L. M. Milne-Thomson) *Standard Four-figure Mathematical Tables including many new tables, trigonometrical functions for radians, inverse trigonometrical and hyperbolic functions, and an extended table of natural logarithms*. London, Macmillan, 1931. xvi, 245 p. *Edition A with positive characteristics in the logarithms, and Edition B with negative characteristics in the logarithms*.
4. T. I, "Multiples of  $\frac{1}{2}\pi$ ", a substantial contribution to T. II, "Circular functions," and T. IV, "15-decimal values of  $\sinh \pi x$  and  $\cosh \pi x$ " in BAASMTTC, *Mathematical Tables*, v. 1, London, 1931, 1946, p. 2-7, 24-25.
5. *Four-Figure Tables of the natural and logarithmic trigonometric functions with the Argument in Time*, London, the author, 1931, 32 p.
- 6<sub>1</sub>. *Interpolation and Allied Tables*. Reprinted from the *Nautical Almanac for 1937*. Ed. by L. J. C., London, 1936.
- 6<sub>2</sub>. Slightly enlarged ed., 1942.
7. BAASMTTC, *Mathematical Tables*, v. 6, *Bessel Functions, part I, Functions of Orders Zero and Unity*. Cambridge, 1937. Prepared under the direction of L. J. C. with a "Description of the Tables and Their Preparation."
8. *Tables of  $\tan^{-1} x$  and  $\log (1 + x^2)$  to assist in the calculation of ordinates of a Pearson Type IV curve (Tracts for Computers, no. 23)*, Cambridge, Univ. Press, 1938. 18 p.
9. *Hughes' Tables for Sea and Air Navigation*, London, Marine Instruments Ltd., 1938. lvi, 182 p. Reprinted, 1943. See MTAC, v. 1, p. 111-112.
10. *Seven-Figure Trigonometrical Tables for every Second of Time*, London, His Majesty's Stationery Office, 1939. 101 p. Ms. completed in 1932; see MTAC, v. 1, p. 43.
- 11<sub>1</sub>. (with J. T. PETERS) *Achtstellige Tafel der trigonometrischen Funktionen für jede Sexagesimalsekunde des Quadranten*. Berlin, Landesaufnahme, 1939; xii, 902 p. See under Peters no. 22<sub>1</sub>.

- 11<sub>2</sub>. *Eight-figure Table of the Trigonometrical Functions for Every Sexagesimal Second of the Quadrant*, London, War Office, offset print, 1939 and 1940.
- 11<sub>3</sub>. *Eight-place Table of Trigonometric Functions for every Sexagesimal Second of the Quadrant*, Ann Arbor, Mich., Edwards Bros., offset print, 1943.
12. (with H. O. Hartley) "Table of Lagrangian coefficients for harmonic interpolation in certain tables of percentage points," *Biometrika*, v. 32, 1941, p. 183–186. See *MTAC*, v. 1, p. 77.
13. "New tables of statistical variables," *Biometrika*, v. 32, 1942, p. 301–308.
14. *Tables of Squares of all Numbers less than 300* (printed card), London, Scientific Computing Service, 1942.
15. BAASMTTC, *Mathematical Tables*, part-volume *A*, *Legendre Polynomials*. Cambridge, Univ. Press, 1946. 42 p. This v. was designed by, and largely computed under the direction of L. J. C.

#### ALLAN JOSEPH CHAMPNEYS CUNNINGHAM (1842–1928)

B. Delhi, India, son of Maj. Gen. Sir ALEXANDER CUNNINGHAM, K.C.I.E. (1814–1893, soldier, archaeologist, and numismatist—see *Dict. Nat. Biog., Suppl.*, v. 2, 1901); brother of Sir ALEXANDER FREDERICK DOUGLAS CUNNINGHAM, K.C.I.E. (1852–1935—see *Who was Who 1929–40*); grandson of the Scottish poet ALLAN CUNNINGHAM (1784–1842, F. BOASE, *Modern English Biog.*, v. 4, Truro, 1908). Educated in England and commissioned Lieutenant to the Bengal Engineers (1860); saw active service with the Bhutan Field Force (1865–1866) and received the medal with clasp. Chief appointment in India was as Assistant Principal of the Thomason Engineering College at Roorkee, United Provinces, where he was Instructor in Mathematics (1871–1881). Returned to England (1881); Captain (1872), Major (1884), Lieut. Colonel (1889), retired from Army (1891) and devoted the leisure of the rest of his life to the Theory of Numbers. Instructor in Constructions at School of Military Engineering, Chatham (1895–1900). Awarded the Telford premium by the Institution of Civil Engineers, London (1883) and elected a fellow of Kings College, London (1869). Member of the Council of London Math. Soc. (1893–1902), and served as a Vice-president (1898). By his will Cunningham bequeathed to this Society his mathematical library, a legacy on trust to complete the publication of his works, and a legacy to improve the method of factorizing large numbers.

#### P

Photograph taken by Elliott & Fry, London (1926).

#### B

1. POGGENDORFF 4, 1904, p. 286, 1704; 5, 1925; 6, 1936.
2. A. E. WESTERN, *Lond. Math. Soc., Jn.*, v. 3, 1928, p. 317–318.
3. D. H. LEHMER, *Guide to Tables in the Theory of Numbers* (Nat. Res. Council, *Bull.* no. 105), Washington, 1941. The text includes a



listing of Cunningham's tables and their errors, as well as statements as to their place in the development of the field.

# T

Listed errata in some of the following tables were given by LEHMER (B 3) and are referred to below.

1. "On finding factors," *Mess. Math.*, v. 20, 1890, p. 40.
2. "On 2 as a 16-ic residue," *London Math. Soc., Proc.*, s. 1, v. 27, 1896, p. 118-122.
3. [High primes], *Lond. Math. Soc., Proc.*, s. 1, v. 28, 1897, p. 378.
4. *A Binary Canon, showing Residues of Powers of 2 for Divisors under 1000, and Indices to Residues.* London, 1900, viii, 172 p.
5. "Period-lengths of circulates," *Mess. Math.*, v. 29, 1900, p. 166-179. See Lehmer.
6. (with H. J. WOODALL) "Determination of successive high primes," *B.A.A.A.S., Report, 1900*, p. 646; and *1901*, p. 553.
7. (with H. J. WOODALL) [solution of problem 14305], *Math. Quest. Educ. Times*, v. 73, 1900, p. 86-94.
8. (with J. CULLEN) "On idoneal numbers," *B.A.A.S., Report, 1901*, p. 552.
9. (with H. J. WOODALL) "Determination of successive high primes," *Mess. Math.*, v. 31, 1902, p. 165-176; v. 34, 1904, p. 72-89; v. 34, 1905, p. 184-192.
10. "High primes  $p = 4\omega + 1$ ,  $6\omega + 1$ , and factorisations," *Quart. Jn. Math.*, v. 35, 1903, p. 19-21.
11. *Quadratic Partitions.* London, 1904, xxiii, 266 p. See Lehmer.
12. "On Haupt-exponent tables," *Mess. Math.*, v. 33, 1904, p. 145-155; v. 34, 1904, p. 31.
13. (a) "Factor-tables errata," (b) "Quadratic partition tables—errata," *Mess. Math.* (a) v. 34, 1904, p. 24-31; v. 35, 1905, p. 24; (b) v. 34, 1905, p. 132-136.
14. [Sol. of prob. 6487—table of four 9s], *Math. Quest. Educ. Times*, n. s., v. 7, 1905, p. 43-46.
15. (with H. J. WOODALL) "Haupt-exponents of 2," *Quart. Jn. Math.*, v. 37, 1905, p. 141-142; v. 42, 1911, p. 248-250; v. 44, 1912, p. 45-48, 240-242; v. 45, 1914, p. 120-125. See Lehmer.
16. [Sol. of prob. 15897], *Math. Quest. Educ. T. n. s.*, v. 10, 1906, p. 46-47.
17. "On high Pellian factorisations," *Mess. Math.*, v. 35, 1906, p. 185.
18. "Evidence of Goldbach's theorem," *Mess. Math.*, v. 36, 1906, p. 29-30.
19. [Sol. prob. 16135], *Math. Quest. Educ. Times*, n. s., v. 12, 1907, p. 61.
20. "High quartan factorisations and primes," *Mess. Math.*, v. 36, 1907, p. 163-174. See Lehmer.
21. "On hyper-even numbers and Fermat Numbers," *Lond. Math. Soc., Proc.*, s. 2, v. 5, 1907, p. 268-274.
22. (with H. J. WOODALL) "High trinomial binary factorisations and primes," *Mess. Math.*, v. 37, 1907, p. 77-82.
23. "On binal fractions," *Math. Gazette*, v. 4, 1908, p. 266-267.
24. "High sextan factorisations," *Mess. Math.*, v. 39, 1909, p. 58-63, 125-128.
25. "Number of primes of given linear forms," *Lond. Math. Soc., Proc.*, s. 2, v. 10, 1911, p. 250-253.

26. "Equation indéterminée," *L'Intermédiaire d. Math.*, v. 18, 1911, p. 45-46.
27. [Sol. of prob. 17007], *Math. Quest. Educ. Times*, n. s., v. 2, 1911, p. 91.
28. "Determination of successive high primes (fourth and fifth papers)," *Mess. Math.*, v. 41, 1911, p. 1-16; v. 54, 1924, p. 5-19.
29. "On tertial, quintal, etc., fractions," *Math. Gazette*, v. 6, 1911, p. 110-116.
30. "On quasi-Mersennian numbers," *Mess. Math.*, v. 41, 1912, p. 138-146.
31. [Sol. prob. 17115], *Math. Quest. Educ. Times*, n. s., v. 21, 1912, p. 73.
32. [Sol. prob. 17226], *Math. Quest. Educ. Times*, n. s., v. 22, 1912, p. 109.
33. "On Mersenne Numbers," Intern. Congr. Mathems; Cambridge 1912, *Proc.*, v. 1, 1913, p. 385.
34. [Sol. probs. 17314, 17297], *Math. Quest. Educ. Times*, n. s., v. 23, 1913, p. 64-66.
35. [Note on large primes], *Sphinx Oedipe*, v. 8, 1913, p. 95.
36. "Factorisation of  $N = (y^4 \mp 2)$  and  $(2y^4 \mp 1)$ ," *Mess. Math.*, v. 43, 1913, p. 52-57.
37. "Roots ( $y$ ) of  $y^{p^\alpha} \mp 1 \equiv 0 \pmod{p^k}$ ," *Mess. Math.*, v. 43, 1913, p. 155-163.
38. "On the number of primes of same residuacity," Lond. Math. Soc., *Proc.*, s. 2, v. 13, 1913, p. 264-272.
39. [Sol. prob. 17839], *Math. Quest. Educ. Times*, n. s., v. 27, 1915, p. 105-106.
40. "Factorisation of  $N = (y^y \mp 1)$  and  $(x^{xy} \mp y^{xy})$ ," *Mess. Math.*, v. 45, 1915, p. 51-58, 66, 72-75. See Lehmer.
41. "Factorisation of  $N = (x^y \mp y^x)$ ," *Mess. Math.*, v. 45, 1916, p. 190-192.
42. "Theory of numbers tables—errata," *Mess. Math.*, v. 46, 1916, p. 49-69.
43. (with H. J. WOODALL) "Factorisation of  $Q = (2^q \mp q)$  and  $(q \cdot 2^q \mp 1)$ ," *Mess. Math.*, v. 47, 1917, p. 28-38.
44. "Factorisation of  $N$  &  $N' = (x^y \mp y^x) \div (x \mp y)$ , etc. [where  $x - y = 1$ ]," *Mess. Math.*, v. 49, 1919, p. 21-34.
45. (with T. GOSSET) "4-tic & 3-bic residuacity tables," *Mess. Math.*, v. 50, 1920, p. 5-7, 9, 11, 12, 26-30.
46. "Factorisation of  $N$  &  $N' = (1) (x^n \mp y^n) \div (x \mp y)$ , etc., when  $x - y = n$ ," *Mess. Math.*, v. 52, 1922, p. 16-34.
47. (with H. J. WOODALL & T. G. CREAK) *Haupt Exponents, Residue-Indices, Primitive Roots and Standard Congruences*. London, 1922, viii, 136 p. See Lehmer.
48. (with H. J. WOODALL & T. G. CREAK) "On least primitive roots," Lond. Math. Soc., *Proc.*, s. 2, v. 21, 1922, p. 344-346, 349-358. See Lehmer.
49. (with T. G. CREAK) *Fundamental Congruence Solutions, Giving One Root ( $\xi$ ) of Every Congruence  $y^k \equiv +1 \pmod{p \text{ and } p^k}$  for all Primes and Prime-Powers  $< 10,000$* . London, 1923, xviii, 92 p.
50. *Binomial Factorisations*. 9 v., London, 1923-1929, xcvi, 288 p. + lxxix, 215 p. + lxix, 203 p. + vi, 160 p. + lxxii, 120 p. + 103 p. + 117 p. + iv, 237 p. + vii, 167 p. The posthumous volumes 8-9 were edited by CONSTANCE I. MARKS. In 1933 a supplement (11 p.)



to these 9 v. was published by the London Math. Soc., mostly from facts submitted by N. G. W. H. BEEGER. See Lehmer.

51. (with H. J. WOODALL) *Factorisation of  $y^n \mp 1$ ,  $y = 2, 3, 5, 6, 7, 10, 11, 12$  up to high powers( $n$ ).* London, 1925, xx, 24 p. See Lehmer.
52. *Quadratic and Linear Tables.* London, 1927, xii, 170 p.
53. "Factorisation of  $y^n \mp 1$ , [ $y > 12$ ]," *Mess. Math.*, v. 57, 1927, p. 75-80. See Lehmer.

### JOHANN MARTIN ZACHARIAS DASE (1824-1861)

B. Hamburg, Germany. The most gifted arithmetical mental calculator who has ever lived; gave many public exhibitions of his powers in Germany and England.

#### P

1. Ball, v. 2, lithograph engraving,  $6\frac{1}{2} \times 9$  ins.

#### B

1. *Zacharias Dase. Aufschlüsse und Proben seiner Leistungen als Rechenkünstler mitgetheilt von ihm selbst aus seinem Album*, Berlin, 1856, vi, 122 p.
2. *Briefwechsel zwischen C. F. Gauss und H. Schumacher*, Altona, v. 3, 1861, p. 382; v. 5, 1863, p. 30, 32, 277-278, 295-298, 300-304; v. 6, 1865, p. 27-28, 78, 112.
3. POGGENDORFF 1, 1863.
4. J. W. L. GLAISHER, "On factor tables," *Cambridge Phil. So., Proc.*, v. 3, 1878, p. 128-130.
5. E. W. SCRIPTURE, "Arithmetical prodigies," *Amer. J. Psychology*, v. 4, 1891, p. 18-20, 34, 40-41, 45, 47, 56, 59, 63.
6. F. D. MITCHELL, "Mathematical prodigies," *Amer. J. Psychology*, v. 18, 1907, p. 75-77, 97, 101, 102, 109, 110, 112, 115, 121, 128, 131, 142.
7. R. C. ARCHIBALD, "Mathematicians, and poetry and drama," *Science*, n. s., v. 89, 1939, p. 46.

#### T

1. "Tafel für kleinste Anzahl von Cuben aus welchen die Zahlen bis 12,000 zusammengesetzt werden können," *J. f. d. reine u. angew. Math.*, v. 42, 1851, p. 61-69; see also C. G. J. JACOBI, p. 41-60.
2. *Tafel der natürlichen Logarithmen der Zahlen in der Form und Ausdehnung wie die der gewöhnlichen oder Brigg'schen Logarithmen berechnet*, Vienna, 1850, iv, 195 p. Reprinted from Vienna, Univ., Sternwarte, *Annalen*, v. 34. *Letter Schumacher to Gauss* May 20, 1850: "Dase kommt eben aus Wien zu mir. Sie haben seine natürlichen Logarithmen mit 7 Decimalen in einem Quartbände gedruckt, von dem ihm 500 Exemplare bewilligt worden sind. Er hat aber nur drei erhalten und die andern liegen in Wien bis er 326 fl. für das Papier bezahlt. Er geht nun nach England um durch *Vorstellungen* (*Productionen*, wie er es nennt) soviel zusammen zu bringen, dass er seine Tafeln auslösen könne. Mir Scheint die Oesterreichische Regierung hätte dem armen Teufel die 326 fl. schenken sollen."



3. *Factoren-Tafeln für alle Zahlen der siebenten Million, oder genauer von 6 000 001 bis 7 002 000, mit den darin vorkommenden Primzahlen*, Hamburg, 1862, vi, 112 p. The introduction contains remarks on Dase and a letter from Gauss.
4. *Factoren-Tafeln für alle Zahlen der achten Million . . .*, Hamburg, 1863, p. 113-224 + iv.
5. (with H. ROSENBERG) *Factoren-Tafeln für alle Zahlen der neunten Million . . .*, Hamburg, 1865, p. 225-334 + iii. Two prints, with differing results for 8 236 079, and 8 245 589.

#### HAROLD THAYER DAVIS (1892- )

B. Beatrice, Nebraska. A.B. Colorado Coll. (1915); A. M. Harvard Univ. (1919); Ph.D. Univ. of Wisconsin (1926); prof. math. Indiana Univ. (1923-1937); acting prof. econometrics Colorado Coll. (1937); prof. math. Northwestern Univ. since 1937, and chm. dept. since 1942.

#### P

1. See plate (1945).

#### B

1. POGGENDORFF 6, 1936.
2. *Leaders in Education*, second ed. New York and Lancaster, Pa., 1941.
3. *Who's Who in Amer.*, v. 23, 1944-1945. Chicago, 1944.
4. *Amer. Men of Science*, seventh ed. Lancaster, Pa., 1944; starred since sixth ed.

#### T

1. (with W. J. KIRKHAM) "A new table of the zeros of the Bessel functions," *Amer. Math. So., Bull.*, v. 33, 1927, p. 760-772.
2. (with V. V. LATSHAW) "Formulas for the fitting of polynomials by the method of least squares," *Annals of Math.*, s. 2, v. 31, 1930, p. 52-78.
3. "Polynomial approximation by the method of least squares," *Annals Math. Statistics*, v. 4, 1933, p. 155-195.
4. *Tables of the Higher Mathematical Functions*, Bloomington, Indiana, v. 1, 1933, xiii, 377 p.; v. 2, 1935, xiii, 391 p. Tables of gamma, psi, and polygamma functions; Bernoulli polynomials and Bernoulli numbers, Euler polynomials and Euler numbers, Gram polynomials, functions of polynomial approximation.
5. *The Analysis of Economic Time Series*, Bloomington, Indiana, 1941: "values of the Walker probability function," p. 584-599; "values of the Fisher probability function," p. 602-605.

#### LEONARD EUGENE DICKSON (1874- )

B. Independence, Iowa, U.S.A. B.Sc. (1893), A.M. (1894) Univ. Texas; Ph.D. Univ. Chicago (1896); prof. math. Univ. Chicago (1900-1941); emeritus Prof. since 1941; fellow Nat. Acad. Sci. (1918); corresp. memb., sect. geom., Acad. Sci., Institut de France (1920); outstanding contributor, prolific author, and historian, in the field of the theory of numbers; received first award \$1000 for the most notable contribution to the advancement of

science at the Cincinnati meeting of the A.A.A.S. (1924); hon. Sc.D., Harvard Tercentenary Celebration (1936), and Princeton Univ. (1941); hon. life member Math. Assoc. Amer. (1941).

## PB

1. R. C. ARCHIBALD, *A Semicentennial History of the American Mathematical Society 1888-1938*, New York, 1938, p. 183-194 + portrait plate; Bibl. p. 185-194. See plate (1932).

## B

1. POGGENDORFF 4, 1904; 5, 1925.
2. *Nat. Cycl. Amer. Biog.*, v. 18. New York, 1922.
3. *Who's Who in America*, v. 23, 1944-1945, Chicago, 1944.
4. *Amer. Men of Science*, seventh ed. Lancaster, Pa., 1944; starred since the first ed.
5. E. T. BELL, *The Development of Mathematics*, second ed. New York, 1945; various references in the index.

## T

1. "A new extension of Dirichlet's theorem on prime numbers," *Mess. Math.*, v. 33, 1904, p. 158-161.
2. "Theorems and tables on the sum of the divisors of a number," *Quarterly J. Math.*, v. 44, 1913, p. 267-296.
3. "Finiteness of the odd perfect and primitive abundant numbers with  $n$  distinct prime factors," *Amer. J. Math.*, v. 35, 1913, p. 420-422.
4. "All positive integers are sums of values of a quadratic function of  $x$ ," *Amer. Math. So., Bull.*, v. 33, 1927, p. 718-719.
5. *Studies in the Theory of Numbers*. Chicago, 1930, p. 150-151, 179-185.
6. BAASMTTC, *Mathematical Tables*, v. 3, *Minimum Decompositions into Fifth Powers*. London, B.A.A.S., 1933, vi, 370 p.
7. *Researches on Waring's Problem*. Washington, Carnegie Institution, 1935, vi, 257 p.
8. *Modern Elementary Theory of Numbers*. Chicago, 1939, p. 58, 79, 83, 112-113, 118.

## HERBERT BRISTOL DWIGHT (1885- )

B. Geneva, Ill. McGill Univ. B.Sc. (1909), D.Sc. (1924); designer of electrical machinery, Can. Westinghouse Co. (1909-25); prof. elec. eng. Mass. Inst. Techn. since 1925. His first book was *Constant-Voltage Transmission*, New York, 1915.

## PB

1. Engineering Institute of Canada, *Engineering J.*, v. 7, 1924, p. 156.
2. A portrait of Dwight appears in *The Technique*, published annually by the senior class of Mass. Inst. Techn., 1932-1944; he is also in a group picture of the electrical engineering department, 1929-1931.
3. See plate (1935).

## B

1. Poggendorff 6, 1936.
2. *Who's Who in America*, v. 20, 1938-1939. Chicago, 1938.



3. *Who's Who in Engineering*, fifth ed. New York, 1941.
4. *American Men of Science*, seventh ed. Lancaster, Pa., 1944.
5. *MTAC*, v. 1, p. 288.

## T

- 1<sub>1</sub>. "A precise method of calculation of skin effect in isolated tubes," A.I.E.E., *J.*, v. 42, 1923, p. 830; tables of  $\text{ber } x$ ,  $\text{bei } x$ ,  $\text{ber}' x$ ,  $\text{bei}' x$ ,  $\text{ker } x$ ,  $\text{kei } x$ ,  $\text{ker}' x$ ,  $\text{kei}' x$ .
- 1<sub>2</sub>. No. 3, T. I, p. 813.
- 1<sub>3</sub>. No. 4, p. 211-214.
- 1<sub>4</sub>. No. 6, T. I, partial abbreviation.
- 2<sub>1</sub>. "Proximity effect in wires and thin tubes," A.I.E.E., *J.*, and *Trans.*, each, v. 42, 1923, p. 969 and 858; table of Bessel functions  $J_n(xi^{3/2})$ .
- 2<sub>2</sub>. Also in no. 8, p. 218-221.
- 3<sub>1</sub>. "Bessel functions for A-C problems," A.I.E.E., *Trans.*, v. 48, 1929, p. 813-815.
- 3<sub>2</sub>. T. I reprinted from no. 1.
- 3<sub>3</sub>. T. II-III in no. 4, p. 215-217.
4. *Tables of Integrals and Other Mathematical Data*, New York, 1934 x, 222p.; rev. ed., 1947, x, 250p. see *MTAC*, RMT 154, 447. See also nos. 1, 3.
5. "Elliptical integrals of large moduli," A.I.E.E., *Electrical Engineering*, and *Trans.*, each v. 54, 1935, p. 709-711.
- 6<sub>1</sub>. "Values of the Bessel functions  $\text{ber } x$  and  $\text{bei } x$  and their derivatives," A.I.E.E., *Trans.*, v. 58, 1939, p. 787-790.
- 6<sub>2</sub>. Also in no. 8, p. 214-217.
- 6<sub>3</sub>. T. I is a partial abbreviation of a portion of no. 1.
7. "A five-figure table of the Bessel function  $I_n(x)$ ," A.I.E.E., *Electrical Engineering*, *Trans.*, and *Trans.*, each v. 60, 1941, p. 135-136; computing done by students at M.I.T. under the direction of Dwight.
- 8<sub>1</sub>. *Mathematical Tables of Elementary and Some Higher Mathematical Functions Including Trigonometric Functions of Decimals of Degrees and Logarithms*, New York, 1941. See also nos. 2, 6.
- 8<sub>2</sub>. Third impression with additions 1944; see *MTAC*, v. 1, p. 180.
9. "Table of the Bessel functions and derivatives  $J_2$ ,  $J_1'$ ,  $J_2'$ ,  $N_2$ ,  $N_1'$ ,  $N_2'$ ," *J. Math. Phys.*, v. 25, 1946, p. 93-95. See *MTAC*, v. 2., p. 173.

## JAMES GLAISHER (1809-1903)

B. Rotherhithe, London, England. Nestor of meteorologists, in charge, at the R. Astron. Observatory, Greenwich, of the magnetic and meteorological department (1838-74); F.R.S. (1849); Meteorological So. founded in 1850 with G. as secy., serving till 1872; actively associated with aeronautics, making many ascents, the most famous being in 1862 to a height of 37,000 feet. Member of the BAASMTTC when his son, J. W. L. Glaisher, was its secretary.

## P

1. C. H. TURNOR, *Astra Castra, Experiments and Adventures in the Atmosphere*, London, 1865, p. 229-240, 385-389, portrait on plate between p. 462 and 463.



2. J. GLAISHER and others, *Travel in the Air*, second rev. ed., London, 1871; picture, "Mr. Glaisher insensible at the height of seven miles."
3. *Harpers Weekly*, v. 28, Aug. 23, 1884, p. 555.
4. *Ill. London News*, v. 84, 1884, p. 93, woodcut; v. 122, 1903, p. 228.
5. A bust by Albert Toft, presented in 1887 by the fellows of the R. Photographic So., belongs to the R. Meteorological So. Reproduction in *Ill. London News*, v. 90, 1887, p. 145-146.
6. *Pop. Sci. Mo.*, v. 36, 1890, p. 546-551 + portrait plate oppo. p. 433.
7. R. SÜRING, "Zum Gedächtnis an James Glaisher," *Illustr. aeron. Mitt.*, Strassburg, v. 7, 1903, p. 132-136, portrait in text.
8. W. MARRIOTT, R. Meteorolog. So., *Quart. J.*, v. 29, 1903, p. 115-120 + portrait plate.

## B

1. POGGENDORFF 3, 1897; 4, 1904; 5, 1925.
2. W. C. NASH, *Observatory*, v. 26, Mar. 1903, p. 129-132.
3. W. ELLIS, R.A.S., *Mo. Notices*, v. 64, Feb. 1904, p. 280-287.
4. H. P. HOLLIS, *Dict. Nat. Biog. 1901-1911*, v. 2, London, 1912, p. 117-119.

## T

1. *Factor Table for the Fourth Million, containing the least factor of every number not divisible by 2, 3, or 5 between 3,000,000 and 4,000,000*, London, 1879.
  2. *Factor Table for the Fifth Million...*, London, 1880.
  3. *Factor Table for the Sixth Million...*, London, 1883.
- Work on these tables was done with the aid of two computers; the BAASMTTC made a grant of £250 towards the cost of doing the work.

## JAMES WHITBREAD LEE GLAISHER (1848-1928)

B. Lewisham, Kent, England. F.R.S. (1875); refused the invitation to become Astronomer Royal (1881); president London Math. So., Cambridge Phil. So., R.A.S. (twice), and Section A of B.A.A.S.; fellow, lecturer and tutor Trinity Coll., Cambridge; DeMorgan medallist (1908); Sylvester medallist (1913); editor *Mess. Math.*, 1871-1929 (last), *Quart. J. Math.*, 1878-1928. Eldest son of James Glaisher *supra*.

## PB

1. M. RIESZ, *Acta Mathematica 1882-1912, Table Générale des Tomes*, 1-35, Upsala and Stockholm, 1913, p. 56, 179.
2. BALL, v. 3 (early photograph  $3\frac{3}{4} \times 5\frac{1}{2}$  ins., autograph underneath).
3. Photograph by A. G. Dew Smith,  $12 \times 15$  ins., in Trinity College Library.
4. A. R. FORSYTH, R. So. London, *Proc.*, v. 126, p. i-xi + portrait plate.
5. H. T. DAVIS, *Tables of the Higher Mathematical Functions*, v. 2, Bloomington, Indiana, 1935. Opp. p. 196 is a reproduction of a drawing of Glaisher by Francis Dodd, made in 1927 for the master and fellows of Trinity College. The drawing,  $10\frac{1}{2} \times 14\frac{5}{8}$  ins., is in the Trinity College Library; see Plate (1927).

## B

1. POGGENDORFF 3, 1897; 4, 1904; 5, 1925; 6, 1937.
2. *The Times*, London, Dec. 8, 1928, p. 14b; Dec. 10, p. 10e; Dec. 11, p. 11d (about his sampler collection); H. Rackham, Dec. 12, p. 19d.
3. A. R. FORSYTH, *Nature*, v. 123, Jan. 26, 1929, p. 135-138.
4. H. ZEITLINGER, *Nature*, v. 123, Feb. 9, 1929, p. 206-207.
5. H. H. TURNER, R.A.S., *Mo. Notices*, v. 89, 1929, p. 300-308.
6. G. H. HARDY, "Dr. Glaisher and the 'Messenger of Mathematics,'" *Mess. Math.*, v. 58, 1929, p. 159-160. Quotation: "It is then only natural that a large proportion of well known English mathematicians should have begun their careers as authors in the *Messenger*. Baker, Barnes, Burnside, Elliott, and Forsyth, for example, all began there. It is a little more surprising to find that J. J. Thompson and Jeans both published their first mathematical papers in the *Messenger*, and that both of them started as experts in the theory of numbers."
7. A. R. FORSYTH, London Math. So., *J.*, v. 4, 1929, p. 101-112.
8. *Who's Who*, London, 1929, and *Who Was Who 1916-1928*, 1929.
9. J. J. THOMPSON, *Cambridge Review*, v. 50, Jan. 25, 1929, p. 212-213.
10. BERNARD RACKHAM, *Catalogue of the Glaisher Collection of Pottery and Porcelain in the Fitzwilliam Museum, Cambridge*, Cambridge University Press, 1935. 2 v. Large and sumptuous volumes, v. 1, text and 36 colored plates; v. 2, 266 collotypes. This collection of over 3000 objects represents Glaisher's chief hobby activity during more than thirty years. This bequest included also "the sum of ten thousand pounds to be applied in making provision for the care, preservation and exhibition of such collection or contributing to the cost of any building for these purposes or otherwise in connection with the same." See reviews in *Connoisseur*, v. 96, p. 99, 105-107, Aug. 1935; and *Revue Belge d'Archéologie et d'Histoire de l'Art*, v. 5, July, 1935, p. 277-279. Glaisher was also a collector of valentines and children's books.
11. A. R. FORSYTH, *Dict. Nat. Biog. 1922-1930*, London, 1937.

## T

1. "Tables of the numerical values of the sine-integral, cosine-integral, and exponential-integral," R. So. London, *Trans.*, v. 160, 1870, p. 370, 374-387.
2. "On a class of definite integrals," *Phil. Mag.*, s. 4, v. 42, 1871, p. 436, "table of the values of the error function."
3. Values of  $\ln N$ ,  $N = 2, 3, 5, 10$ , and the Euler constant, each to 100D, R. So. London, *Proc.*, v. 19, 1871, p. 521-522.
4. Tables of  $\int_0^\infty \sin(u^x)du$ ,  $\int_0^\infty \sin(u^x)dx$ , and  $\int_0^\infty \cos(u^x)du$ , *Mess. Math.*, v. 1, 1871, p. 107.
5. "On the constants that occur in certain summations by Bernoulli's series," London Math. So., *Proc.*, v. 4, 1872, p. 55-56, tables.
6. On the enumeration of primes, B.A.A.S., *Report*, 1872, p. 20 (of sectional trans.); 1877, p. 20-23; 1878, p. 470-471; 1879, p. 47-49, 268; 1880, p. 30-38; 1881, p. 303-308; 1883, p. 119-125.
7. "Tables of the first 250 Bernoulli numbers and their logarithms," Cambridge Phil. So., *Trans.*, v. 12, 1873, p. 384-391.





L. E. DICKSON 1932





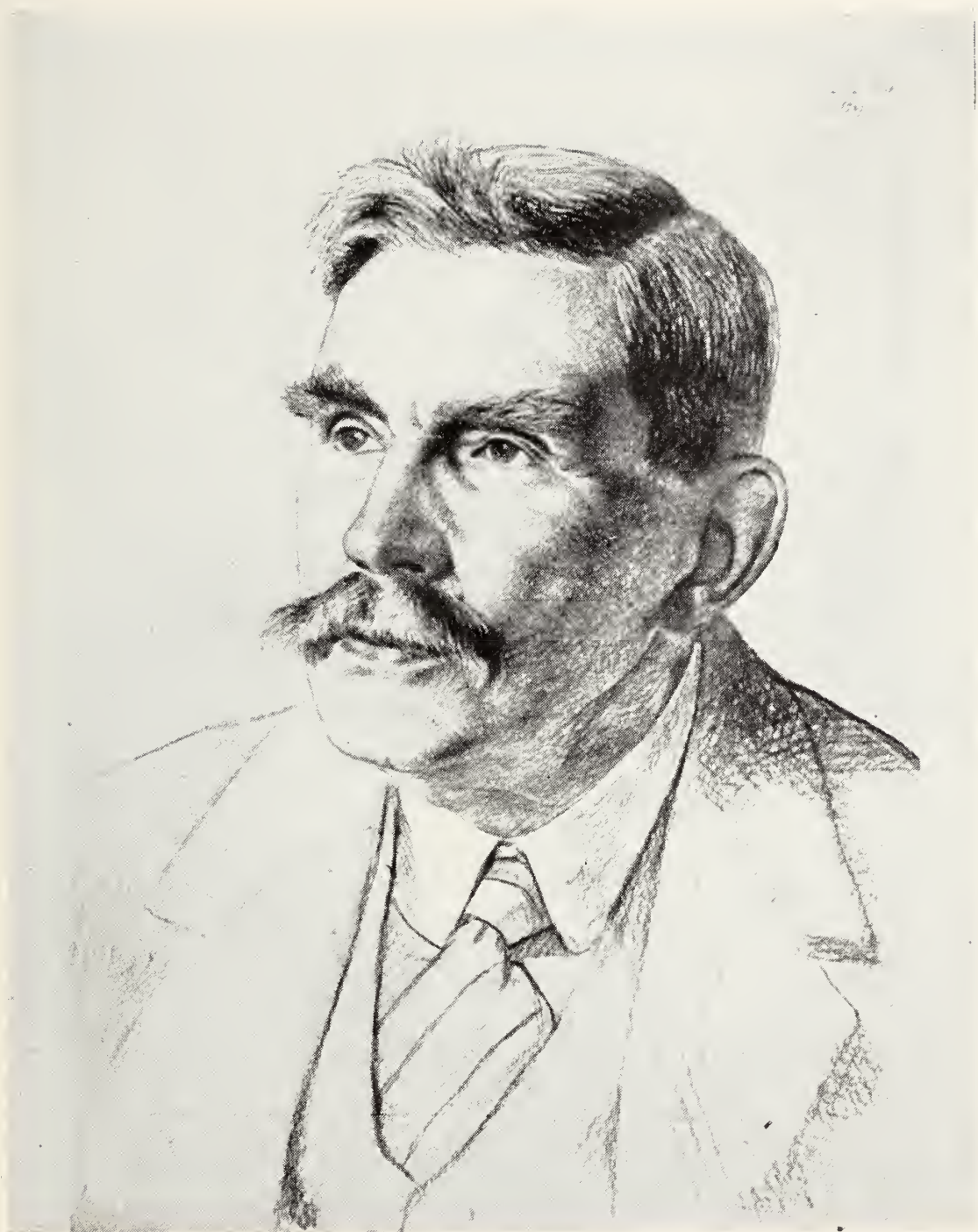


H. B. DWIGHT 1935









J. W. L. GLAISHER 1927







J. KEPLER 1620





8. "Value of the unit angle to a great number of decimal places," London Math. So., *Proc.*, v. 4, 1873, p. 310.
9. "Numerical values of certain continued fractions," *Quart. J. Math.*, v. 13, 1875, p. 255-259.
10. "On a numerical continued product," *Mess. Math.*, v. 6, 1876, p. 73-76; see also p. 189-192.
11. "Preliminary account of the results of an enumeration of the primes in Dase's tables (6 000 000 to 9 000 000)," Cambridge Phil. So., *Proc.*, v. 3, 1877, tables, p. 21-23.
12. "Preliminary account of an enumeration of the primes in Burckhardt's tables (1 to 3 000 000)," Cambridge Phil. So., *Proc.*, v. 3, 1877, tables p. 48-56.
13. "On an elliptic function solution of Kepler's problem," R.A.S., *Mo. Notices*, v. 37, 1877, p. 366-386.
14. "Numerical values of the first twelve powers of  $\pi$ , of their reciprocals, and of certain other related quantities," London Math. So., *Proc.*, v. 8, 1877, p. 140-145.
15. Euler's table of  $\Sigma_n = \frac{1}{2^n} + \frac{1}{3^n} + \frac{1}{5^n} + \frac{1}{7^n} + \frac{1}{11^n} + \dots$ , corrected, Assoc. Franç. p. l'Avan. d. Sc., *Compte Rendu*, v. 6, 1877, p. 175.
16. "On long successions of composite numbers," *Mess. Math.*, v. 7, 1877-78, tables, p. 104-105, 171-176.
17. "On factor tables, with an account of the mode of formation of the factor table for the fourth million," Cambridge Phil. So., *Proc.*, v. 3, 1878, p. 99-138, 228-229, + plate V (tables). Compare J. GLAISHER, T 1.
18. "On circulating decimals with special reference to Henry Goodwyn's 'Table of circles' and 'Tabular series of decimal quotients,'" Cambridge Phil. So., *Proc.*, v. 3, 1878, table p. 204-206.
19. "An enumeration of prime-pairs," *Mess. Math.*, v. 8, 1878, p. 29-31.
20. "Tables of the Legendrian functions," B.A.A.S., *Report*, 1879, p. 49-57 + plate.
21. "Separate enumeration of primes of the form  $4n + 1$  and of the form  $4n + 3$ ," R. So. London, *Proc.*, v. 29, 1879, tables p. 195-197.
22. "On the value of the constant in Legendre's formula for the number of primes inferior to a given number," Cambridge Phil. So., *Proc.*, v. 3, 1880, tables p. 299-304.
23. "Tables of the exponential function," Cambridge Phil. So., *Trans.*, v. 13, 1883, p. 243-272. The incidental table of  $1/n!$  on p. 246-247 is reprinted as T. LIII of *Tables for Biometricians and Statisticians*. ed. by K. PEARSON, part II, Cambridge, 1931.
24. "On the function which denotes the difference between the number of  $(4n + 1)$ -divisors and the numbers of  $(4n + 3)$ -divisors of a number," London Math. So., *Proc.*, v. 15, 1884, tables p. 106.
25. "On the function  $\chi(n)$ ," *Quart. J. Math.*, v. 20, 1885, tables p. 151-154, 164-165.
26. "On the coefficients in the  $q$ -series for  $\pi/2K$  and  $2G/\pi$ ," *Quart. J. Math.*, v. 21, 1885; table p. 66.
27. "On the square of Euler's series," London Math. So., *Proc.*, v. 21, 1889, tables p. 190-192.

28. "On the function which denotes the excess of the number of divisors of a number  $\equiv 1, \text{ mod } 3$ , over the number  $\equiv 2, \text{ mod } 3$ ," *London Math. So., Proc.*, v. 21, 1890, table p. 402.
29. "Sums of the inverse powers of the prime numbers," *Quart. J. Math.*, v. 25, 1891, tables p. 350, 353.
30. "On the series  $1/3^2 - 1/5^2 + 1/7^2 + 1/11^2 - 1/13^2 - \dots$ ," *Quart. J. Math.*, v. 26, 1893, p. 47.
31. "On the series  $\frac{1}{3} - \frac{1}{5} + \frac{1}{7} + \frac{1}{11} - \frac{1}{13} - \dots$ ," *Quart. J. Math.*, v. 25, 1891, tables p. 379-381; "On the series  $\frac{1}{2} + \frac{1}{5} - \frac{1}{7} + \frac{1}{11} - \frac{1}{13} + \dots$ ," v. 26, 1893, tables p. 56-59.
32. "Products and series involving prime numbers only," *Quart. J. Math.*, v. 27, 1895, p. 270-337; v. 28, 1895, p. 1-174, various tables.
33. "On the definite integrals connected with the Bernoullian function," *Mess. Math.*, v. 26, 1897, p. 152-182; various results which might be regarded as a table.
34. "The Bernoullian function," *Quart. J. Math.*, v. 29, 1897, p. 1-168; varied numerical results.
35. "Table of the values of  $[f(x) =] \frac{1}{2} \cdot \frac{2}{3} \cdot \frac{4}{5} \cdots \frac{x-1}{x}$ , the denominators being the series of prime numbers," *Mess. Math.*, v. 28, 1898, p. 1-16, tables of  $f(x)$  and  $\log f(x)$ .
36. "On a set of coefficients analogous to the Eulerian numbers," *London Math. So., Proc.*, v. 31, 1899, tables, p. 222, 224, 229, 232.
37. "Congruences relating to the sums of products of the first  $n$  numbers and to other sums of products," *Quart. J. Math.*, v. 31, 1899, tables p. 26-28.
38. "Table of the excess of the number of  $(3k + 1)$ -divisors of a number over the number of  $(3k + 2)$ -divisors," *Mess. Math.*, v. 31, 1901, p. 65-72.
39. "Table of the excess of the number of  $(8k + 1)$ - and  $(8k + 3)$ -divisors of a number over the number of  $(8k + 5)$ - and  $(8k + 7)$ -divisors," *Mess. Math.*, v. 31, 1901, p. 86-91.
40. "On the series  $1 - \frac{1}{3^2} + \frac{1}{5^2} - \frac{1}{7^2} + \frac{1}{9^2} - \dots$ " and "On the series  $1 - \frac{1}{3^4} + \frac{1}{5^4} - \frac{1}{7^4} + \frac{1}{9^4} - \dots$ ," *Mess. Math.*, v. 33, 1903, p. 1-30.
41. "Numerical values of the series  $1 - 3^{-n} + 5^{-n} - 7^{-n} + \dots$ ," *Mess. Math.*, v. 42, 1912, tables p. 41, 43, 45, 46, 48-49, 51-58.
42. "On Eulerian numbers (formulae, residues, end-figures), with the values of the first twenty-seven," *Quart. J. Math.*, v. 45, 1913, p. 14, 16, 23, 26-30, 35-43.
43. "Tables of  $1 \pm 2^{-n} + 3^{-n} \pm 4^{-n} + \dots$  and  $1 + 3^{-n} + 5^{-n} + 7^{-n} + \dots$  to 32 places of decimals," *Quart. J. Math.*, v. 45, 1914, p. 141-158.
44. "On the coefficients in the expansions of  $\cos x/\cos 2x$  and  $\sin x/\cos 2x$ ," *Quart. J. Math.*, v. 45, 1914, p. 187-222; various tables.



45. "The earliest use of the radix method for calculating logarithms, with historical notices relating to the contributions of Oughtred and others to mathematical notation," *Quart. J. Math.*, v. 46, 1915, p. 125-197; some quoted tabular illustrations.
46. "Table of binomial-theorem coefficients," *Mess. Math.*, v. 47, 1917, p. 97-107.
47. BAASMTTC, *Mathematical Tables*, v. 8, *Number-Divisor Tables designed and in part prepared by J. W. L. Glaisher, extended and edited by the Committee . . .*, Cambridge, Univ. Press, 1940, x, 100 p.
48. BAASMTTC, *Mathematical Tables*, v. 9, *Table of Powers giving integral powers of Integers. Initiated by J. W. L. Glaisher extended by W. G. Bickley, C. E. Gwyther, J. C. P. Miller, E. J. Ternouth on behalf of the Committee . . .*, Cambridge, Univ. Press, 1940, xii, 132 p.

### JÓZEF MARIA HOËNE-WROŃSKI (1778-1853)

B. Posen City, Poland, or near to it. Served in Polish and Russian armies (1793-1798); went to France (1801), where he spent the rest of his life. Besides 38 v. in the fields of mathematics and physics he published 35 works on philosophical and sociological subjects. Hoëne-Wroński's father was Antoni Hoene but there is basis for thinking that he was raised to the nobility and became "Antoni Hoene de Wroński" (see DICKSTEIN PB 2, p. 4-5). When the son was in the army he usually dropped his first names altogether. The family name Hoene has appeared in such different forms as: Höhne, Hoehne, Heyne, Hoëne, Hoëné.

#### PB

1. *Oeuvres Mathématiques de Hoëne Wronski*, 4 v. Paris, 1925. Portrait frontispiece in v. 1: engraved by Mme. FRÉDÉRIQUE O'CONNELL
2. S. DICKSTEIN, *Hoene Wroński. Jego Życie i Prace*, Cracow, 1896, vi, 368 p. Portrait frontispiece and folding plate facsimile of Wroński's writing. Bibl.
3. BALL 3, photograph by Paulussena Wiedman,  $5\frac{1}{2} \times 7$  ins., from a painting.

#### B

1. POGGENDORFF 1, 1863.
2. E. WEST, *Exposé des méthodes générales en mathématiques, résolution et intégration des équations, applications diverses, d'après Hoëné-Wronski*, Paris, 1886, x, 314 p. Mainly a reprint of articles in *J. d. Math*, 1881-1883.
3. S. DICKSTEIN, "Sur les découvertes mathématiques de Wronski," *Bibl. Mathematica*, s. 2, v. 6, 1892, p. 48-52, 85-90; v. 7, 1893, p. 9-14; v. 8, 1894, p. 49-54, 85-87; v. 10, 1896, p. 5-12.
4. T. MUIR, *The Theory of Determinants in their Historical Order of Development*. London, v. 1, second ed., 1906, p. 78-79; v. 2, 1911, p. 219-229; v. 3, 1920, p. 248-256; v. 4, 1923, p. 242-250; v. [5], 1930, p. 275-292. The "wronskian," a name first suggested by Muir in 1887, occurs in a Wronski v. of 1812.
5. G. LORIA, *Storia delle Matematiche*, Turin, v. 3, 1933, p. 257-262.



6. R. DE MONTESSUS DE BALLORE, "Wronski, mathématicien," *Revue Scientifique*, v. 73, 25 May 1935, p. 329-333.
7. G. BRAUN, "L'oeuvre philosophique de Hoëné Wronski: l'architecture du messianisme," *Revue Bleu*, v. 72, 20 Oct. 1934, p. 768-771.
8. *Scripta Mathematica*, v. 4, 1936, p. 85-86, 279.

## T

- 1<sub>1</sub>. *Canons de Logarithmes de H. W. Tables N°1, N°1 bis, N°2, N°3, N°3 bis, N°4. Instructions et Théorie...* Paris, 1827, iv, 64 p. + tables on 6 plates.
- 1<sub>2</sub>. Facsimile print, in HOËNE-WROŃSKI, *Oeuvres*, v. 4. Paris, 1925.
- 0<sub>13</sub>. Russian edition: *Tablitsy Logaritmov Vrońskago*, translated by A. ANNERSKIÏ. St. Petersburg, 1844, 56 p. + 6 plates of tables.
- 1<sub>4</sub>. Polish edition: *Kanony Logarytmów Hoene-Wrońskiego*, translated by S. DICKSTEIN. Warsaw, 1890, iii, 30 p. + 6 tables. Dickstein published also in 1890 *Tablica Logarytmów Hoene-Wrońskiego* [N°3], Warsaw, 16 p. + 1 table.

## ERNST REINHOLD EDUARD HOPPE (1816-1900)

B. Naumburg a.d. Saale, Germany. Prof. math. Univ. Berlin (1872-1900); editor *Archiv d. Math. u. Phys.* (1871-1900), on the death of Grunert, its founder.

## PB

- 1<sub>1</sub>. *Archiv d. Math. u. Physik*, s. 3, v. 1, 1901, p. 4-19 + portrait plate.
- 1<sub>2</sub>. *Archiv d. Math. u. Physik, Generalregister zu den Bänden 1-17 der zweiten Reihe (1884-1900)*, Leipzig, 1901, p. VII-XXXI + portrait plate, including Bibl. of Hoppe's publications.
- 1<sub>3</sub>. Deutsch. Math.-Ver., *Jahresb.*, v. 9, 1901, p. 33-58; portrait in text; includes Bibl. The text of the biography, by E. LAMPE, in each of these references, is taken from Deutsch. Phys. Ges., *Verh.*, v. 2, 1900, p. 183-201.

## B

1. *Boll. d. Bibl. d. Sc. Mat.*, v. 3, 1900, p. 126-127.
2. *Leopoldina*, v. 36, 1900, p. 132.
3. *Wiadomości Matem.*, v. 5, 1901, p. 136-137.
4. J. HENDERSON, *Bibliotheca Tabularum Mathematicarum*. Cambridge, 1926, p. 189-190.

## T

1. *Tafeln zur dreissigstelligen logarithmischen Rechnung*. Leipzig, 1876, 16 p.

## CHARLES HUTTON (1737-1823)

B. Newcastle-on-Tyne, England. Prof. Royal Military Acad. (1773-1807); F.R.S. (1774), foreign secy. (1779-1784); Copley medallist (1778); LL.D. Univ. Edinburgh (1779); editor of the *Ladies Diary* (1773-1818), and of the

*Diarian Miscellany*, 5 v. (1771–1775), and v. 6, *Miscellanea Mathematica* (1772–1775).

## P

1. C. HUTTON, *Tracts on Mathematical and Philosophical Subjects...*, 3 v. London, 1812; portrait frontispiece in v. 1, from a painting by H. Ashby, engraved by C. Turner.
2. Bust executed by SEBASTIAN GAHAGAN, in the Library of the Philosophical So. of Newcastle. Some medals by Wyon were struck with a portrait copied from the bust.
- 3<sub>1</sub>. O. GREGORY, "Brief memoir of the life and writings of Charles Hutton LL.D.," *Imp. Mag.*, v. 5, 1823, cols. 202–227 + portrait plate, reproduction of Wyon's medal engraved by J. Thomson.
- 3<sub>2</sub>. Also reprinted in pamphlet form, London, Caxton Press, 1823, 14 p.; in the New York Public Library.
4. BALL v. 3, Gahagan's bust engraved by J. Thomson,  $4\frac{1}{2} \times 7\frac{1}{2}$  ins.
5. *European Mag.*, v. 83, 1823, p. 483–487 + plate. Gahagan's bust engraved by J. Thomson. The memoir appeared also in *Gentleman's Mag.*, v. 93, 1823, p. 228–232, 296.

## B

1. ° JOHN BRUCE, *A Memoir of Charles Hutton...* Newcastle, 1823.
2. POGGENDORFF 1, 1863.
3. R. E. ANDERSON, *Dict. Nat. Biog.*, v. 38, 1891.
4. *Encycl. Britannica*, eleventh ed., v. 14. New York, 1910.
5. R. C. ARCHIBALD, "Notes on some minor English mathematical serials," *Math. Gazette*, v. 14, 1929, p. 381–382, 388, 390.
6. "Some letters from Charles Hutton to Robert Harrison," *Math. Gazette*, v. 30, May 1946, p. 71–81.

## T

- 1<sub>1</sub>. Table of square roots (10D) and reciprocals (7D) of integers from 1 to 1000, *Miscellanea Mathematica*, London, 1775, p. 329–342.
- 1<sub>2</sub>. Reprinted in F. MASERES, *The Doctrine of Permutations and Combinations*, London, 1795, p. 595–604.
2. *Tables of the Products and Powers of Numbers*, London, 1781, viii, 103 p.
3. Manuscript tables of sines and cosines to 7 places of decimals at interval .00001 radians are described by Hutton in R. Soc. London, *Trans.*, v. 74, 1784, p. 21–34. See also C. HUTTON, *Tracts on Mathem. and Philos. Subjects*, v. 2, London, 1812, p. 122–132, and his *Mathematical Tables*, sixth ed., London, 1822, p. 180.
- 4<sub>1</sub>. *Mathematical Tables: containing Common, Hyperbolic, and Logistic Logarithms. Also Sines, Tangents, Secants, and Versed-Sines, both Natural and Logarithmic.... To which is prefixed a large and original history of the discoveries and writings relating to those subjects. With the complete description and Use of the Tables.* London, 1785, xii, 176, 343 p.
- 4<sub>2+</sub>. Second ed., 1794; third, 1801; fourth, 1804; fifth, 1811; sixth, 1822; seventh, 1830 (reprinted 1834; this and later postmortem eds. edited by O. GREGORY, 1830–1841); eighth, 1838; ninth, 1842; tenth, 1846; eleventh, 1849; twelfth, 1855; "new edition," 1858;



- "new edition" 1860. The historical introduction (124 p.) in the first six editions of these tables is also in Hutton's *Tracts*, v. 1, 1812.
5. Tables of squares, cubes, and seven-place tables of reciprocals, square roots, and cube roots, of integers from 1 to 1000, *Tracts on Mathematical and Philosophical Subjects*, v. 1, London, 1812, p. 466–485.

### CARL GUSTAV JACOB JACOBI (1804–1851)

B. Potsdam, near Berlin, Germany. Entered Univ. Berlin (Ph.D. 1825: Docent 1825–1827). Univ. Königsberg, extraordinary prof. (1827–1832), ordinary prof. (1832–1844); elected member of the Prussian Acad. Sci. (1836); elected correspondent, sect. geom., Acad. Sci., Institut de France (1830) and foreign associate (1846); state pensioner and resident in Berlin (1844–1851). Outstanding mathematician of the nineteenth century, whose chief work was in the fields of elliptic functions, determinants, the theory of numbers, differential equations, the calculus of variations, planetary theory and other dynamical problems. Inventor of functional determinants of the  $n^2$  differential coefficients of  $n$  given functions of  $n$  independent variables which now bears his name (Jacobian) and which has played an important part in many analytic investigations. The great genius, Abel, and Jacobi published fundamental work in elliptic functions almost simultaneously. Legendre also is to be mentioned in this connection.

### PB

1. *C. G. J. Jacobi's Gesammelte Werke*, ed. by C. W. Borchardt and K. Weierstrass for the Prussian Academy of Sciences. 8 v., Berlin, 1881–1891. Portrait plate in v. 1, prepared by Albert in Munich from a daguerreotype and a drawing (no. 4). See no. 2, p. 521–522. In v. 1, p. 1–28 is also a "Gedächtnisrede," by Lejeune-Dirichlet. Compare B 12.
- 2<sub>1</sub>. LEO KOENIGSBERGER, *Carl Gustav Jacob Jacobi . . . Festschrift zur Feier der Hundertsten Wiederkehr seines Geburtstages*. Leipzig, 1904. xviii, 554 p. Photogravure portrait, from a painting made in Rome, in 1843, by AUGUST KASELOWSKI.
- 2<sub>2</sub>. SCRIPTA MATHEMATICA, *Portraits of Eminent Mathematicians*, Portfolio no. 2. New York, 1938; large half-tone portrait plate; biographical sketch by D. E. SMITH.
3. *Briefwechsel zwischen C. G. J. Jacobi und M. H. Jacobi*. (*Abh. z. Gesch. d. math. Wissen.*, Heft 22), ed. W. AHRENS. Leipzig, 1907. xx, 282 p. Portrait plates of Jacobi and his brother Moritz H., a prominent physicist.
4. D. E. SMITH, *History of Mathematics*, v. 1. Boston, 1923, p. 506; portrait after a lithograph from an original drawing.
5. GANESH PRASAD, *Some Great Mathematicians of the Nineteenth Century: Their Lives and Their Works*, v. 1. Benares City, India, 1933; "Jacobi," p. 166–219 + portrait plate, as in no. 1.
- 6<sub>1–2</sub>. E. T. BELL, *Men of Mathematics*. New York, 1937. "The great algorist, Jacobi," p. 327–339; portrait plate oppo. p. 338, copied from no. 1. The French translation, *Les Grands Mathématiciens*. Paris, 1939, does not reproduce any portraits.



- 6<sub>3</sub>. Second ed., New York, Dover Press, 1945.
7. *The Universal Jewish Encyclopedia*, v. 6, New York, 1942. Contains a brief sketch and a poorly reproduced portrait.

## B

1. ISIDORE SINGER, *The Jewish Encyclopedia*, v. 7. New York, 1904; brief article.
2. *Encyclopædia Britannica*, eleventh ed., v. 15. Cambridge, 1911; anonymous short article.
3. C. G. J. JACOBI, *Disquisitiones Analyticae de Fractionibus Simplicibus*, Diss. Berlin, 1825; "Vita," p. 41.
4. GIOVANNI LAMPARIELLO, *Enciclopedia Italiana*, v. 18. Rome, 1933.
5. *Der Briefwechsel zwischen C. G. J. Jacobi und P. H. von Fuss über die Herausgabe der Werke Leonhard Eulers*, ed. P. STÄCKEL & W. AHRENS. Leipzig, 1908.
6. G. MITTAG-LEFFLER, "Niels Henrik Abel," *Revue du Mois*, v. 4, 1907, p. 5-26, 207-229. On p. 217-219 the work of Abel and Jacobi on elliptic functions is discussed.
7. F. KLEIN, *Vorlesungen über die Entwicklung der Mathematik im 19. Jahrhundert*, v. 1. Berlin, 1926, p. 108-115.
8. S. GUNDELFINGER, "Über die Entdeckung der doppelten Periodicität und Jacobis Antheil daran," *Akad. d. Wissen., Berlin, Sitz.*, 1898, p. 342-345.
9. THOMAS MUIR, *The Theory of Determinants in their Historical Order of Development*, v. 1-4. London, 1906-1923. "Jacobians," v. 1 (second ed.) 1906, p. 346-394; v. 2, 1911, p. 230-253; v. 3, 1920, p. 257-271; v. 4, 1923, p. 251-258.
10. I. TODHUNTER, *A History of the Progress of the Calculus of Variations*. Cambridge and London, 1861, p. 243-253.
11. L. E. DICKSON, *History of the Theory of Numbers*, v. 1-3. Washington, D. C., 1919, 1920, 1927; see various references to Jacobi in indices. Also New York, Stechert ed., 1934.
12. P. B. LEJEUNE-DIRICHLET, "Gedächtnisrede auf Carl Gustav Jacob Jacobi," *Akad. d. Wissen., Berlin, Abh.*, 1852, 28 p. Also in *Archiv. Math. Phys.*, v. 22, 1854, p. 158-182. Compare PB 1.
13. M. CANTOR, *Allgemeine Deutsche Biographie*, v. 50. Leipzig, 1905, p. 598-602.
14. POGGENDORFF 1, 1863; 3, 1897; 4, 1904. Also *R. So. Cat. Sci. Papers*, v. 3, 8. London, 1869, 1879. See also under LEGENDRE, B 12.

## T

1. *Canon Arithmeticus, sive tabulae quibus exhibentur pro Singulis Numeris Primis vel primorum potestatibus infra 1000 numeri ad datos indices et indices ad datos numeros pertinentes*. Berlin, 1839. xl, 248 p. 22.5 × 27.3.  
For discussion of, and errors in, this work see D. H. LEHMER, *Guide to Tables in the Theory of Numbers*. Washington, D. C., 1941, p. 13-15, etc., 128, 151.
2. "Zur Theorie der elliptischen Functionen," *J. f. d. reine u. angew. Math.*, v. 26, 1843, p. 109-114, table of  $\log q$ ,  $\theta = [0(0^\circ.1)90^\circ; 5 D]$ ,  $\Delta$ .

- 2<sub>2</sub>. JACOBI, *Gesammelte Werke*, v. 1. Berlin, 1881, p. 363–368.
- 3<sub>1</sub>. “Über die Kreistheilung und ihre Anwendung auf die Zahlentheorie,” *J. f. d. reine u. angew. Math.*, v. 30, 1846, p. 166–182.
- 3<sub>2</sub>. JACOBI, *Opuscula Math.*, v. 1. Berlin, 1846, p. 317–334.
- 3<sub>3</sub>. JACOBI, *Gesammelte Werke*, v. 6. Berlin, 1891, p. 254–274.  
For errors in each of the three editions of this paper, see LEHMER, p. 151.
- 4<sub>1</sub>. “Ueber die Zusammensetzung der Zahlen aus ganzen positiven Cuben; nebst einer Tabelle für die kleinste Cubenanzahl, aus welchen jede Zahl bis 12000 zusammengesetzt werden kann,” *J. f. d. reine u. angew. Math.*, v. 42, 1851, p. 41–69.
- 4<sub>2</sub>. *Opuscula Math.*, v. 2, 1851, p. 361–389.
- 4<sub>3</sub>. *Gesammelte Werke*, v. 6, 1891, p. 322–354.

See also K. G. REUSCHLE, *Neue zahlentheoretische Tabellen sammt einer dieselben betreffenden Correspondenz mit dem verewigten C. G. J. Jacobi*, Progr., Stuttgart, 1856. There is here some discussion of tables by Jacobi.

### JOHANN KEPLER (1572–1630)

B. Weil, or Weilderstadt, Württemberg, near Stuttgart, Germany (at long.  $29^{\circ}7'$ , lat.  $48^{\circ}54'$  according to Kepler himself), 27 Dec. 1571 O.S. = 6 Jan. 1572 N.S. Student at the University of Tübingen, teacher of mathematics and moral philosophy at the Gymnasium at Graz, Austria (where he lived 1594–1600). At Prague (1600–1612) the first two years as assistant of TYGE BRAHE, and later as court astronomer; at Linz (1612–1620, 1622–1626); at Regensburg (Ratisbon, 1620–22, 1626–28); at Sagan (1628–1630), and died at Regensburg where he was buried. Mathematical astronomer and mystic of exceptional genius, outstanding as a brilliant calculator and patient investigator. Discoverer of (a) notable planetary laws and paths in ellipses about the sun as a focus; (b) solutions of maximum-minimum problems concerning cylinders, cones, and wine barrels; (c) empirical or approximate solutions of various integrals; (d) a particular solution of Kepler’s equation  $x = e \sin x + M$ ; (e) two regular star polyhedra (later rediscovered by Poincaré); (f) how to determine whether a conic is a hyperbola, ellipse, parabola, or circle when a vertex, the axis through it, and an arbitrary tangent with its point of contact are given. Studying different sections of a cone in his optics Kepler “notes the transition from ellipse into hyperbola via the parabola, and remarks that one focus of the ellipse passes to infinity when the parabola is reached. This means that the point of intersection of two parallel lines has passed to infinity” (Struik). Kepler immediately appreciated the value of Napier’s logarithms and it was mainly through him and his friends that the Briggsian forms were widely adopted in Europe. Kepler’s own volume of logarithmic tables (1624–25) were further developed in his *Tabulae Rudolphinae Astronomicae* (1627), also containing material due to Tyge Brahe, ranked for a century as the best tabular aid to astronomy.



## PB

On account of the large amount of material to be considered under this heading, we shall not follow the method of numeration employed in other sketches.

1. The most important publication for portraits and many details of Kepler's life is *Johannes Kepler, der Kaiserliche Mathematiker. Kepler-Festschrift. Zur Erinnerung an seinen Todestag vor 300 Jahren*, Naturwiss. Verein zu Regensburg, *Bericht*, Heft 19, 1930, 355 p. + 28 plates. There is a copy of this in the Harvard Univ. Zoology Library. The work contains, besides the speeches by W. v. Dyck, M. Caspar, H. Nestler, K. Stöckl, J. Bauschinger, F. Goldenberger at the Kepler celebration in Regensburg on 24–25 Sept. 1930, the following papers: A. SCHMETZER, "Geschichtliches"; H. HUBER, "Archivalisches und Bibliographisches"; W. BOLL, "Die wichtigsten Kepler-Dokumente in Regensburg"; P. SCHULZ, "Das Kepler-Denkmal in Regensburg"; H. HUBER, "Ein Vorentwurf zum Regensburger Kepler-Denkmal"; . . . E. ANDING, "Kepler's Wirken; erkenntnistheoretisch betrachtet"; H. BOEGEHOLD, "Kepler's Gedanken über das Brechungsgesetz und ihre Einwirkung auf Snell und Descartes"; J. ENGERT, "Kepler's Philosophie und Astrologie"; L. HARTMANN, "Die optischen Arbeiten Keplers"; P. JASCHNOFF, "Kepler-Reliquien, welche in Pulkowo aufbewahrt werden"; A. KORN, "Kepler-Bewegungen innerhalb der Atome und Moleküle"; J. PLASSMANN, "Was kann uns die Polyeder-Theorie lehren?"; M. v. ROHR, "Kepler und seine Erklärung des Sehvorganges"; M. v. ROHR, "Kepler's Behandlung des beidäugigen Sehens"; W. SCHERER, "Johannes Kepler und der Dreikönigstern"; J. SCHICHT, "Keplers Briefe"; H. STEINMETZ, "Bemerkungen zu: Johannes Kepler, *Strena seu de nive sexangula*"; K. STÖCKL, "Der Magnetismus bei Kepler"; H. WIELEITNER, "Über Kepler's *Neue Stereometrie der Fässer*"; A. WILKENS, "Von Kepler zur modernen Theorie der planetaren Bewegungen"; M. WOLF, "Die Planeten 'Kepler' und 'Ratisbona'"; E. ZINNER, "Die Kepler-Bildnisse."

We shall now consider the following portraits reproduced in this volume (the descriptions dating from 1930):

- I. Kepler and his first wife, dating from the period 1597–1600; copied from the original miniatures (5 × 7 cm.) in the Pulkovo Observatory—plate XVIII.
- II. Alleged portrait (37 × 50 cm.) copied about 1800 from a missing original of 1610. This copy is in Kremsmünster, Regensburg—plate XXIII. In 1926 the Academy of Sciences in Vienna considered the possibility of having this portrait copied; but the report of experts they sent to examine the portrait prevented further action.
  - (a) There is a copy in a magazine illustration (1898) and also a collotype copy by Ogawa, Tokyo, in the D. E. Smith Collection, Columbia Univ.
  - (b) Kepler's *Traum vom Mond*, by L. GUNTHER. Leipzig, 1898.



- (c) W. W. BRYANT, *A History of Astronomy*. London, 1907, p. 41. The following false statement is made on p. xi, "from a portrait in the possession of the family."
  - (d) Another reproduction in *Naturwissenschaften*, v. 18, 14 Nov. 1930, oppo. p. 941. There are also articles, A. S. EDDINGTON, "Speech at the Kepler monument in Weilder-Stadt"; M. v. ROHR, "Kepler und seine Erklärung des Schvorganges," p. 941-945; P. JASCHNOFF, "Kepler-Handschriften und Reliquiensammlung der Pulkowoeer Sternwarte," p. 946-949; A. KOPFF, "Johannes Kepler in seinen Briefen," p. 949-951.
- III. Oil painting sent in Sept. 1620 by Kepler to his friend M. BERNEGGER, in Strassburg, who in 1627 presented it to the University Library there. It is now in the University—plate XXV, and is often reproduced, for example, in
- (a) *Enciclopedia Italiana*, v. 20. Rome, 1933, article, p. 167-169, by GIOVANNI SILVA.
  - (b) M. W. BURKE-GAFFNEY, *Kepler and the Jesuits*. Milwaukee, 1944, oppo. p. 42, with the absurd statement "The portrait was painted three years before Kepler died." See plate (1620).
- IV. Kepler in his working room (plate XV) enlargement of a picture in the lower left hand corner of the Title-picture (plate XIV) in Kepler's Rudolphine Tables of 1627; see T 2. For a reproduction of Kepler's rough draft of this Table-picture see *Johannes Kepler in seinen Briefen*, ed. by M. CASPAR & W. v. DYCK, v. 2. Munich, 1930, p. 226.
- V. Kepler monument, erected in Regensburg in 1808, in accordance with the design of Emanuel d'Herigoyen—plate XII. In this monument is a Kepler bust, of Carrara marble, by DÖLL, and the relief by DANNECKER—plate XIII; and a separate picture of the bust—plate I.
- (a) Plate XVI is a reproduction of a painting of the monument executed in 1808 by J. F. FREIHERR v. GOEZ and engraved by H. RITTER, published by J. Bichtel in Regensburg.
  - (b) *Ballou's Pictorial Drawing-Room Companion*, v. 15, 1858, p. 405; biographical sketch, and picture of the statue.
- VI. Kepler monument erected in Weil in 1870 after the design of A. v. KRELING—Plate XVII. It represents a life-sized seated figure on a high pedestal with four niches in which are the four figures; COPERNICUS, MICHAEL MAESTLIN (Kepler's teacher and friend, portrait plate XXIV), TYGE BRAHE, and JOBST BÜRGI.
- (a) E. G. FISCHER, *Kepler und die unsichtbare Welt*, Leipzig, 1882 (new edition of a monograph originally published in 1819 with a fine steel engraving of the monument). There is a poorer reproduction of this in HISTORY OF SCIENCE SOCIETY, *Johann Kepler 1571-1630*, Baltimore, 1931.

- (b) R. Astron. So. Canada, *J.*, v. 25, 1931, plate 4—two views of the monument (one of them with Eddington in the foreground addressing a gathering) from photos taken by C. A. CHANT, in 1928, professor of astronomy at the Univ. of Toronto. On p. 49–53 is an article on Kepler by H. DINGLE, reprinted from *The Spectator*, v. 145, Nov. 15, 1930, p. 715–716.
  - (c) F. E. BRASCH, "Commemoration of the tercentenary of the death of Johann Kepler," *Pop. Astron.*, v. 39, 1931, p. 324; the two views of (b) are reprinted. The 1928 picture is also reproduced in M. W. BURKE-GAFFNEY, *Kepler and the Jesuits*. Milwaukee, 1944, oppo. p. 43.
2. There are very many reproductions and adaptations of the Strassburg portrait of Kepler.
- I. By 1621 a copper engraving ( $11 \times 13$  cm. in size) was made in Strassburg by JACOB VON HEYDEN; it is, however, only an oval head and shoulders picture criticized contemporaneously as poorly reproducing the original. A copy is in the State Library of Bamberg (no. 2933). In the nineteenth century, lithographs of it were made by the Historischer Verein, Regensburg, and appeared in such publications as
    - (a) GUSTAV DROYSEN, *Geschichte der Gegenreformation*. Berlin, 1893, p. 1295.
    - (b) WOLDEMAR VON SEIDLITZ, *Allgemeines historisches Porträtwerk*.... Munich, 1894, v. 2, plate 27.
    - (c) *Monographien zur Weltgeschichte*, ed. by E. HEYCK, v. 3. Bielefeld and Leipzig, 1898. Engraving by Th. Lans, p. 18.
    - (d) *Der Grosse Brockhaus*, v. 10. Leipzig, 1931, p. 87–88.
  - II. In the copper-plate engraved by HEIM (picture surface,  $10 \times 14$  cm.), in 1669, Kepler looks to the right instead of to the left, and the engraving seems less satisfactory than in no. I.
  - III. Copper engraving of the seventeenth or eighteenth century. An oval on a pedestal ( $9.2 \times 7.4$  cm.), face and collar are changed from no. I. Of this, a lithograph was published in the nineteenth century.
  - IV. °E. REITLINGER, C. W. NEUMANN & C. GRUNER, *Johannes Kepler*. Stuttgart, 1868. Contains a steel engraving ( $8.2 \times 10.5$  cm.), by F. WANDERER and T. BAUER, from the Strassburg original. The face is improved over nos. I–III and the coat is materially changed. Unsatisfactory reproductions are
    - (a) S. GÜNTHER, *Kepler, Galilei*. Berlin, 1896.
    - (b) F. DANNEMANN, *Die Naturwissenschaften*..., v. 2, second ed. Leipzig, 1921, p. 114.
  - V. For Kepler's *Opera*, v. 8, part 1, Frankfurt and Erlangen, 1870, CH. FRISCH had CARL NÖRDLING make a portrait plate from the Strassburg painting. It represents Kepler as a young man with full beard and other changes.
    - (a) R. S. BALL, *Great Astronomers*, London, 1895; cheap ed. London, 1907, p. 103.



- (b) A. BERRY, *A History of Astronomy*, London, 1898, and New York, 1899, p. 183.
  - (c) L. DARMSTÄDTER, *Naturforscher und Erfinder*, Bielefeld and Leipzig, 1926.
  - (d) H. A. STRAUSS and S. STRAUSS-KLÖBE, *Die Astrologie des Johannes Keplers*, Munich, 1926.
  - (e) There's a copy of this engraving in the D. E. Smith Library.
- VI. Before 1915, A. BOUBAY made of the Strassburg painting a colored copy later owned by J. BAUSCHINGER. A reproduction of this is given in *Johannes Kepler in seinen Briefen*, ed. by M. CASPAR and W. VON DYCK, v. 1, Munich, 1930, frontispiece.
- VII. About the same time, the Strassburg painting was sent to Stuttgart where a copy was made for the Deutsches Museum, Munich. The treatment in this copy is very free in the face and in the right hand, but furthermore there has been added: compasses in the left hand, resting on a celestial globe on a table, with papers.
- (a) ° JOHANN KEPLER, *Die Zusammenlage der Welten*, ed. by O. J. BRYK, Jena, 1918.
  - (b) History of Science So., *Johann Kepler 1571–1630*, Baltimore, 1931.
- VIII. Engraving by Bollinger, head and shoulders, 17 × 25 cm., published by Gr. Schumann, Zwickau. There is a copy in the D. E. Smith Collection.
- IX. Engraving of head and shoulders by E. M., 9 × 14 cm. More details regarding these engravings may be found in the *Kepler-Festschrift*, 1930, p. 341–342.
3. Of Kepler medals there are two; the first of bronze "Durand edidit," 1823, "series numismatica universalis virorum illustrium," engraved by Caqué, is in the D. E. Smith Library. A very poor reproduction of the portrait-side (full beard) is in no. 7(b). In 1930 memorial medals of 36 and 60 mm. diameter, of gold, silver, and bronze, were manufactured by Karl Goetz in Munich.
  4. ° CHARLES KNIGHT, *Gallery of Portraits*, v. 3. London, 1834, p. 59.
  - 5<sub>1</sub>. LUDWIG BECHSTEIN, *Zweihundert deutsche Männer in Bildnissen*, Leipzig, 1854, plate 59 (woodcut), + text, 2 p.
  - 5<sub>2</sub>. *Zweihundert Bildnisse und Lebensabrisse berühmter deutscher Männer*, fourth ed. Leipzig, 1880; portrait, and very brief sketch.
  6. ° H. HUBER, "Die Keplerbüste in der Walhalla" [Regensburg], *Z. f. bayerische Landesgeschichte*, Munich, v. 5, 1932, p. 455–465.
  7. Perhaps the following portrait belongs to one of the classes I–IX above: (a) E. LEBON, *Histoire Abrégée de l'Astronomie*, Paris, 1899, plate oppos. p. 24. There is an excellent copy of this print in the collection of the New York Public Library, reproduced in (b) SCRIPTA MATHEMATICA, *Portraits of Eminent Mathematicians*, Portfolio no. 2, New York, 1938, portrait plate; biographical sketch by D. E. SMITH.



8. So also for O. SAILE, *Troubadour of the Stars, The Romantic Life of Johannes Kepler* [Translated from the German *Kepler. Roman einer Zeitenwende*, Stuttgart, 1938, by J. A. GALSTON], New York, 1940, frontispiece.
9. In addition to the portraits of Kepler already listed as in the D. E. Smith Collection, are 10 others, including an engraving by C. BARTLE, Verlag d. Bibl. Instituts in Hildburghausen; and one printed by Lloyd (?) in Trieste.

## FALSE PORTRAITS

In 1809 or 1810 a seventeenth-century oil painting was discovered in the collection of Godefroy Kränner, merchant of Regensburg, and later became the property of the Historischer Verein zu Regensburg. On the painting is "Joann. Keppler, geb. 1571." It has now been shown that this is not a portrait of Kepler at all, but of Ludwig X, Herzog in Bayern-Landshut. See J. A. PANKOFER, "Johann Keppler's Bildniss und dessen Echtheit," *Histor. Verein d. Oberpfalz und von Regensburg, Verhandlungen*, v. 6, 1841, p. 156-164; in slightly changed form, the article appears also in ° *Johann Keppler, Kaiserlicher Mathematiker. Verein d. Oberpfalz und von Regensburg, Denkschrift*, 1842, with a reproduction of the portrait. See also H. NESTLER "Ist das Kepler bild in der Walhalla echt?" *Verhandlungen*, v. 81, 1931, p. 123-125, with a reproduction of this oil painting. In the *Kepler-Festschrift*, 1930, there is also an exact reproduction (plate XXVIa) not only of this oil painting, which is very indistinct, but also of the very much clearer Bernhard Grueber drawing (plate XXVIb). It is this drawing which has been so often reproduced. Copies of Grueber's print are, for example, in

- (a) *The Portrait Gallery of Distinguished Poets, Philosophers, Statesmen...*, London, v. 1, 1853, together with a biog. sketch, p. 246-250. Listed in *A. L. A. Portrait Index*, under Kepler.
- (b) *The Imperial Dictionary of Universal Biography*, London, v. 2, 1866, p. 85-86 + plate, according to the *A. L. A. Portrait Index*, but in the 16 v. edition which I have seen, the sketch is in v. 12, p. 85-87, and the plate in v. 16. The biographical sketch is by DAVID BREWSTER.
- (c) O. LODGE, *Pioneers of Science*. London, 1919, p. 76.
- (d) W. W. BRYANT, *Kepler (Pioneers of Progress. Men of Science series)*. London, 1920, frontispiece.
- (e) H. S. WILLIAMS, *The Great Astronomers*. New York, 1930, plate oppo. p. 156.
- (f) H. MACPHERSON, *Makers of Astronomy*. Oxford, Clarendon Press, 1933, frontispiece, and text p. 18-31.
- (g) There is an engraving of this by F. MACKENZIE in the D. E. Smith Collection.

In 1841 the Historischer Verein zu Regensburg ordered for its Walhalla gallery, a "Kepler" bust from DÖLL, based on the false pictures already in the gallery, as noted above; a reproduction of this false bust is given in plate XXVII of the *Kepler-Festschrift*.

To sum up, there are two, and only two, portraits of Kepler, which may with certainty be regarded as true likenesses, namely: (1) the miniature of 1597–1600; (2) the oil painting which Kepler gave to his friend in 1620. We reproduce the latter from the picture of the original in the *Kepler-Festschrift*; see Plate (1620).

## B

Many important biographical items have been already listed under **PB**.

The following list of further carefully selected items, some of them comparatively popular, will enable the student to round out his information in various directions.

- 1<sub>1</sub>. J. L. F. BERTRAND, *Notice sur la Vie et les Travaux de Képler*, Paris, Institut Impérial de France, 1863. 38 p.
- 1<sub>2</sub>. English translation in Smithsonian Institution, *Report*, 1871, p. 93–110.
2. AGNES M. CLERKE, *Enc. Britannica*, eleventh ed., v. 15. Cambridge, 1911, p. 749–751.
- 3<sub>1</sub>. D. BREWSTER, *The Martyrs of Science...*, London, 1841, p. 201–267.
- 3<sub>2</sub>. Seventh ed. London 1870, p. 165–220.
4. H. W. TURNBULL, *The Great Mathematicians*. London, 1929; “Napier and Kepler,” p. 60–69.
5. F. ARAGO, *Oeuvres Complètes, Notices Biographiques*, v. 3. Paris, n. d., p. 199–240.
6. C. TAYLOR, “Geometry of Kepler and Newton,” *Cambridge Phil. So., Trans.*, v. 18, 1900; “Kepler,” p. 197–205.
7. H. WIELEITNER, “Keplers ‘Archimedische Stereometrie,’ ” *Unterrichtsblätter f. Mathem. u. Naturw.*, v. 36, 1930, p. 176–185.
8. G. KOWALEWSKI, *Der Keplersche Körper und andere Bauspiele, mit 53 Textfiguren (Scientia Delectans, Heft 3)*. Leipzig, 1938, 65 p.
9. H. LEBESGUE, “Lois de Kepler et de Newton,” *L'Enseignement Scientifique*, v. 6, 25 Feb. 1933, p. 129–133.
10. M. CASPAR, “Kepler und die Infinitesimalrechnung,” *Unterrichtsblätter f. Mathem. u. Naturw.*, v. 38, 1932, p. 227–229.
11. P. EPSTEIN, “Die Logarithmenberechnung bei Kepler,” *Z. f. mathem. u. naturw. Unterricht*, v. 55, 1924, p. 142–151.
12. A. V. BRAUNMÜHL, *Vorlesungen über Geschichte der Trigonometrie*, v. 2. Leipzig, 1903, p. 18–38.
13. JAMES HENDERSON, *Bibliotheca Tabularum Mathematicarum*. Cambridge, 1926, p. 30–32, 34–38, 207.
14. CHARLES HUTTON, *Mathematical Tables...* London 1785; in the Introduction, “Kepler’s construction of logarithms,” p. 48–60, is a translation of Kepler’s propositions and an account of his method of calculation.
15. A. DAZEW, “Ein mechanischer Weg zur Lösung der Keplerschen Gleichung,” *Astron. Nachr.*, v. 253, 8 Sept. 1934, col. 191–192.
16. J. J. ÅSTRAND, *Hilfstafeln zur leichten und genauen Auflösung des Kepler’schen Problems*. Leipzig, 1890. xii, 110 p.
17. A. SPEISER, *Die mathematische Denkweise*. Zürich, 1932; “Kepler und die Lehre von Weltharmonie,” p. 110–135.
18. N. HERZ, *Johannes Keplers Astrologie*. Vienna, 1895, 147 p.



19. ° M. CASPAR, "Die Anschauung Keplers über die Astrologie," *Süd-deutsche Monatshefte*, v. 24, 1927, p. 159–161.
20. S. GÜNTHER, *Allgemeine Deutsche Biographie*, v. 15, Leipzig, 1882, p. 603–624.
21. J. B. J. DELAMBRE, *Histoire de l'Astronomie Moderne*, v. 1, Paris, 1821, p. 314–615.
22. J. S. BAILLY, *Histoire de l'Astronomie Moderne*, v. 2. Paris, 1779, p. 1–128.
23. M. CASPAR, *Bibliographia Kepleriana. Ein Führer durch das gedruckte Schrifttum von Johannes Kepler mit 80 Faksimile*. Munich, 1936. Remarkably valuable publication for any student of Kepler. The facsimiles are title-pages of Kepler's publications. There is a bibliography of 224 publications about Kepler and his work.
24. W. v. DYCK, "Nova Kepleriana. Wiederaufgefundene Drucke und Handschriften von Johannes Kepler," Bay. Akad. d. Wissen., *Abhandlungen, mathem.-naturw. Abt.*: (i) "Einleitung" and "Briefwechsel mit Edmund Bruce," v. 28, no. 2, 1915, 11 + 17 p.; (ii) "Prognostica auf die Jahre 1604 und 1624" and "Das Glaubensbekenntnis von Johannes Kepler vom Jahre 1623," v. 25, nos. 5 and 9, 1910 and 1912, 61 + 45 p.; (iii) "Die Keplerbriefe auf der Nationalbibliothek und auf der Sternwarte in Paris" (ed. with M. Caspar) v. 31, no. 1, 1926, 114 p.; (iv) "Die Keplerbriefe auf der Braunschweigischen Landesbibliothek in Wolfenbüttel, I–III, neue Folge, nos. 18, 1933, 58 p., no. 23, 1934, 90 p., no. 3, 1936, 63 p. (ed. F. HAMMER); (v) "Johannis Kepleri Notae ad Epistolam D. D. M. Hafenrefferi" (ed. by M. Caspar), neue Folge, no. 14, 1932, 30 p.; (vi) "Prognosticum auf das Jahr 1620" (with M. Caspar), neue Folge, no. 17, 1933, 58 p.
25. *Johannes Kepler in seinen Briefen*, ed. by M. CASPAR & W. v. DYCK, 2 v. Munich, 1930. xxviii, 396, xvi, 348 p.
26. Fritz Kubach, *Johannes Kepler als Mathematiker*, Diss. Heidelberg, Karlsruhe, Druck von G. Braun, 1935. 83 p. 4to.
27. E. T. BELL, *The Development of Mathematics*, second ed. New York, 1945; various index references.

## T

- 1<sub>1</sub>. *Joannis Kepleri Imp. Cæs. Ferdinandi II. Mathematici Chilias Logarithmorum ad totidem numeros Rotundos, Præmissâ Demonstratione Legitima Ortus Logarithmorum eorumque usus Quibus Nova Traditur Arithmetica, Seu Compendium, quo post Numerorum notitiam nullum nec admirabilius, nec utilius solvendi pleraq;....* Marburg, 1624. 56 p. + 26 unnumbered leaves of tables.

In the following year appeared *Supplementum Chiliadis Logarithmorum*, Marburg, 1625, p. 112–216. Deals mainly with the use and application of logarithms and problems of various types are solved; no tables.

- 1<sub>2</sub>. Reprint, Marburg, 1639. Only the first two leaves are reprinted with different type.
- 1<sub>3</sub>. F. MASERES, *Scriptores Logarithmici...*, v. 1, London, 1791; reprint of Kepler's *Chilias Logarithmorum* and *Supplementum*, p. 1–166.

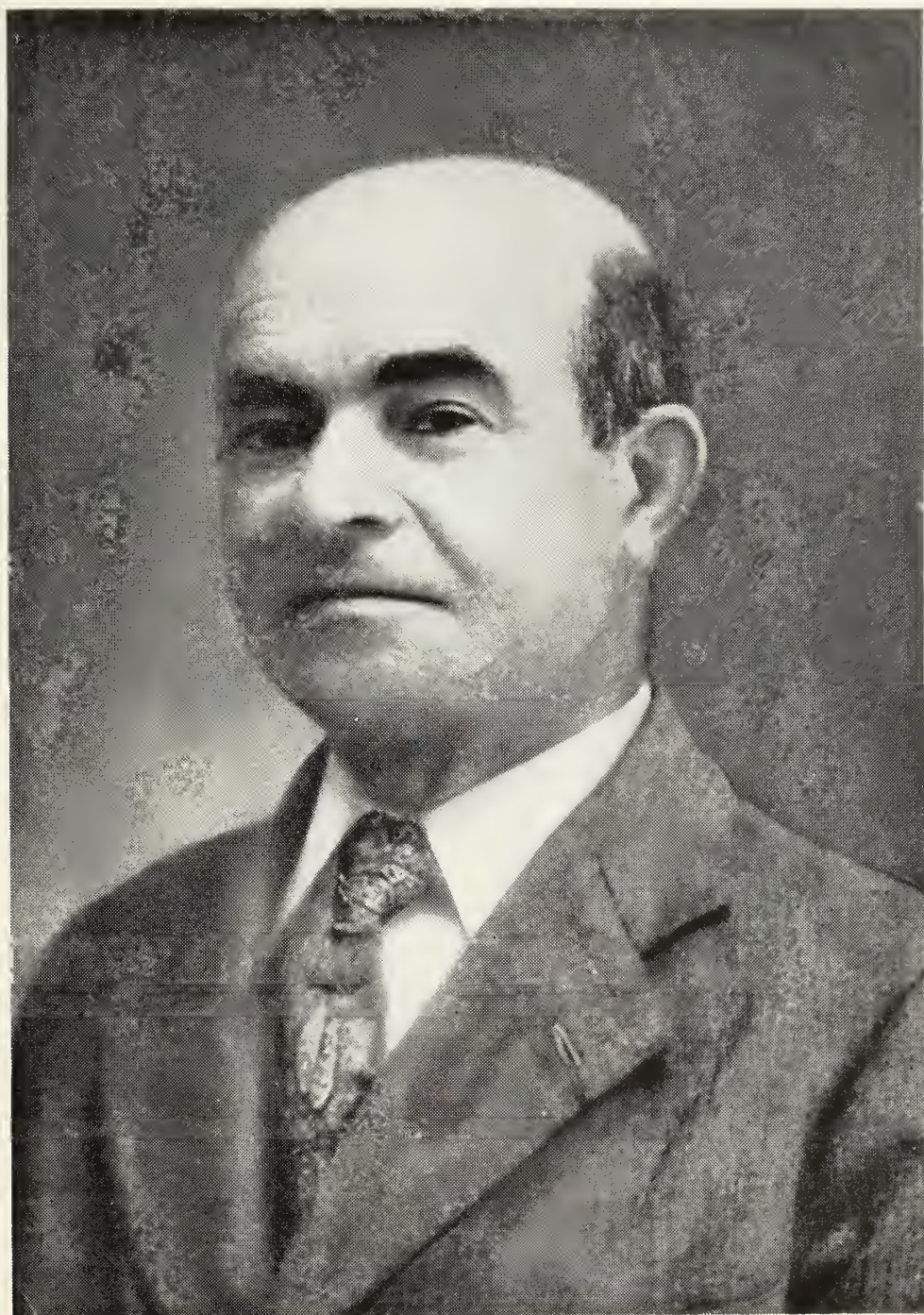


- 1<sub>4</sub>. KEPLER, *Opera*, ed. by CH. FRISCH, v. 7. Frankfurt and Erlangen, 1868, p. 317–408, with *Supplementum*; “prooemium editoris,” p. 295–315. See also B 14.
- 2<sub>1</sub>. *Tabulæ Rudolphinæ*.... Ulm, 1627. Folio format, 23 × 33 cm. This work is mainly a treatise on astronomy with the use of Napier’s logarithms. On p. 12–23 of the tables are (a) Napier’s tables of logarithmic sines and cosines to 2 figures less than in the *Descriptio* for 0(1′)90°; (b) logarithmic tangents to 6 figures 0(1′)10°; (c) logarithmic cosines 0(10″)1°40′.
- 2<sub>2–3</sub>. Editions edited by J. B. MORIN, Paris, 1650, 1657.
- 2<sub>4</sub>. English translation of Morin’s edition, London, 1675.
- 2<sub>5</sub>. Second London edition, 1676.
- 2<sub>6</sub>. THOMAS STREETE, *Astronomia Carolina*... *Quam ob insigneum ex Idiomate Anglicano in latinam Linguam transtulit Joh. Gabriel Doppelmayr... et Appendicis loco addidit TABULAS RUDOLPHINAS a Joh. Baptista Morino... in breve et facile compendium redactas*. Nürnberg, 1705. viii, 213 p. + 70 p. (Appendix).
- 2<sub>7</sub>. Kepler, *Opera*, ed. Frisch, has some extracts, v. 6, 1866, frontispiece, p. 530–721; v. 7, 1868, p. 409–440.

Kepler’s early death prevented the execution of his plan for the preparation of a comprehensive table of logarithms. Soon after his death, however, his son-in-law JAKOB BARTSCH (1600–1632) published

- 2A<sub>1</sub>. ° An *Appendix* (Sagan, 1630, 46 p.) to the Rudolphine Tables. *Jacobi Bartschii, Doct. Math., Tabulae Novae Logarithmicologicæ*. In 1936 CASPAR (B 23, p. 96) listed 9 German libraries where copies of this Appendix were located. Since the folio format of the Rudolphine Tables was not useful for handling, Bartsch published in the following year a little volume (9.5 × 15.3 cm.) of tables which may be regarded as the second edition of the tables in question.
- 2A<sub>2</sub>. Second edition: *Ioan. Keppleri Math. Cæs. Logarithmorum Logisticorum Heptacosias quintuplicata, sive Trichil-Hexacosias Jac. Bartschi D. Mathem. Canon Manvalis Sexagesimorum et Horariorum Scrupulorum Logarithmicus: Ad singula min. secunda sexagesima exacte supputatus: Et tam ad novam Logisticæ Astronomicæ Logarithmicæ praxin, quàm ad faciliorem & pleniorẽ Rudolph. Tabb. & Ephemeridum usum compendiosissimum, seorsim sic editus ab Authore J.B.D.* Sagan, 1631, 64+332 p. Two tables of the Appendix are omitted in this edition but three new ones are added.
- 2A<sub>3</sub>. Third edition: Strassburg, 1700, 302 p., edited by J. K. EISENSCHMIDT, with only slight changes, except for the omission of the last two tables. Compare B 21, DELAMBRE, p. 530–532. Copies of this edition are common; but of the 1631 edition the only known copy seems to be that one at the University of Königsberg.

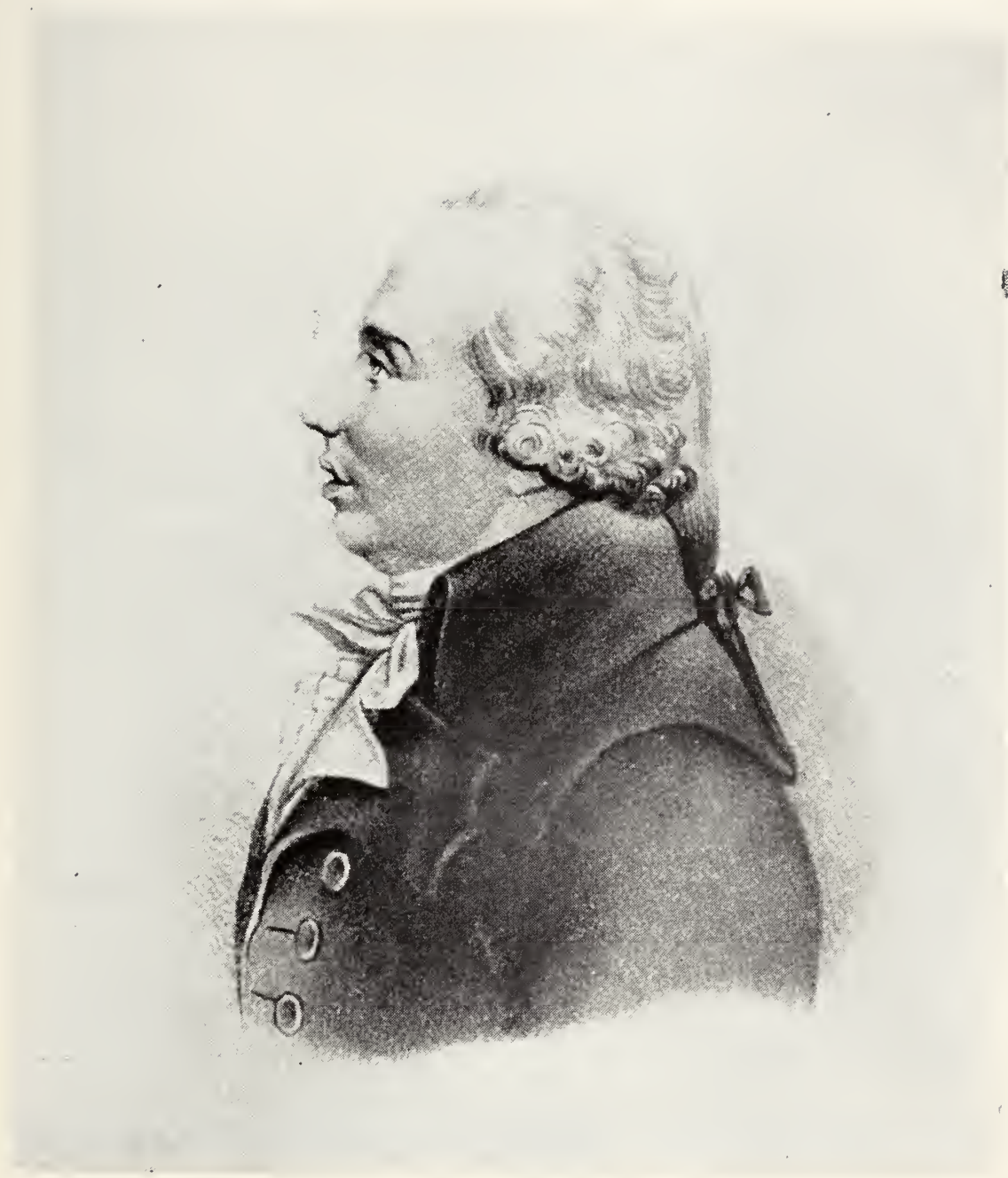




M. B. KRAÏTCHIK 1941







A. M. LEGENDRE







D. H. LEHMER 1936







D. N. LEHMER 1936





## MAURICE BORISOVICH KRAÏTCHIK (1882- )

B. Minsk, Russia. Lived in Brussels, Belgium (1905–1940); doctorate Univ. Liège (1910); author of volumes in the fields of theory of numbers, and mathematical recreations; editor of dept. “récréations mathématiques” [scientifiques] in *L'Échiquier*, v. 1–7, 1925–Feb., 1931; editor *Sphinx*; *revue mensuelle des Questions Récréatives*, v. 1–9, 1931–1939. After coming to the United States in 1941 he became an associate prof. math., New School for Social Research, New York. Returned to Brussels, Spring 1946.

## B

1. *L'Échiquier*, v. 6, 1930, portrait plate opp. p. 940; sketch p. 995.
2. *Comptes-Rendus du Premier Congrès International de Récréation Mathématique*, Brussels, 1935, p. 12. V.-president of Congress, portrait, and address; p. 24–25 group picture of Congress members. *Comptes-Rendus du Deuxième Congrès...*, Paris, 1937, Brussels, 1937, p. 8–9 group picture of members of the Congress; also in *Sphinx*, v. 7, 1937, p. 148–149.
3. See plate (1941).

## B

1. POGGENDORFF 6, 1937.

## T

1. *Les Tables Graphiques Financières; recueil d'abaques pour les Calculs financiers*. Paris, 1918.
2. Second ed. Paris, 1928, 16 folio p.
3. Third ed., rewritten, 8 charts, with explanations in English, French, German, and Spanish, Brussels, 1939.
2. *Décomposition de  $a^n \pm b^n$  en Facteurs dans le cas où  $nab$  est un carré parfait, avec une Table des Décompositions numériques pour toutes les valeurs de  $a$  et  $b$  inférieures à 100*, Paris, 1922, p. 3, 6, 9–16.
3. *Théorie des Nombres*, Paris, v. 1, 1922, p. 164–217; v. 2, 1926, p. 30–71, 119, 156–166, 221–235.
4. *Récherches sur la Théorie des Nombres*, Paris, v. 1, 1924, p. 9–16, 20, 23–27, 39–41, 46, 48–50, 53, 55, 62–65, 69–70, 77–80, 87, 92, 131–267; v. 2, 1929, p. 2–4, 6, 84–159.
5. “Factorisation de  $2^{4n} + 1$ ,” *Sphinx*, v. 2, 1932, p. 85.
- 6–9. “Les grands nombres premiers,” *Mathematica*, Cluj, v. 7, 1933, p. 93; *Sphinx*, v. 3, 1933, p. 100–101; (with S. Hoppenot) *Sphinx*, v. 6, 1936, p. 162–168; *Deuxième Congrès Int. d. Récréations math., Comptes Rendus*, Brussels, 1937, p. 69–73, and *Sphinx*, v. 8, 1938, p. 82–86.
10. “Table de Factorisation de  $6^n + 1$ ,” *Sphinx*, v. 4, 1934, p. 48.
11. “Factorisation de  $2^n \pm 1$ ,” *Sphinx*, v. 8, 1938, p. 148–150.

## JOSEPH JÉRÔME LE FRANÇOIS DE LALANDE (1732–1807)

B. Bourg-en-Bresse, France. Member Acad. d. Sci. (1753); prof. astronomy Collège de France (1761); director of the Observatory, Paris (1768–1807).



## PB

1. *European Mag.*, v. 17, 1790, p. 83–85 + portrait plate.
2. A. V. ARNAULT, *Biographie nouvelle des Contemporains*, Paris, v. 10, 1823, p. 361–372 + portrait plate.
3. C. GAVARD, *Galeries Historiques de Versailles*, Paris, 1838–1841, Séries I–XI, with supplements of which the Library of Congress copy is bound in 18 v. The reproduction of the painting of LaLande is in section 7 of série X, and is accompanied by a few biographical notes.
4. *Petit Larousse Illustré*, Paris, 1909, p. 1410.

## B

1. J. B. J. DELAMBRE, Acad. d. Sci., Paris, *Mémoires, cl. sci. math. et phys.*, for 1807, Paris, 1808, Histoire, p. 20–57.
2. J. M. QUÉRARD, *La France Littéraire, ou Dictionnaire Bibliographique*, v. 4, Paris, 1830, p. 455–460.
3. JACOB, *Nouvelle Biographie Générale*, v. 28, Paris, 1859, cols. 948–953.
4. POGGENDORFF 1, 1863.
5. ° C. JARRIN, *Jérôme Lalande et la Breue au XVIII<sup>e</sup> Siècle*, Bourg, 1869, 80 p. In the Bibliothèque Nationale.

## T

- 1<sub>1+</sub>. LaLande's name occurs in connection with a very large number of editions of his tables especially after his death (1807). Since somewhat misleading statements have been made by Glaisher, and Henderson, who did not, apparently, have at their disposal the extraordinary amount of information presented in the *Catalogue Général* (v. 86, 1925) of the Bibliothèque Nationale in Paris, and in D. BIERENS DE HAAN, *Tweede Ontwerpeener Naamlijst van Logarithmentafels*, Amsterdam, 1875, it seems well to summarize the facts here.

LaLande tells us that N. L. DE LACAILLE (d. 1762) and he published in 1760 a six-place table, *Tables de Logarithmes pour les sinus et tangentes de toutes les minutes du quart de cercle et pour tous les nombres naturels, depuis 1 à 10 800, avec une exposition abrégée de l'usage de ces tables*. In the next edition, got out by J. F. M. MARIE (1738–1801) in 1768, the table of numbers was extended to 20 000 and the "exposition" was enlarged from 19 to 53 p. In the 1781, 1791, 1799, 1804 (last) editions the table of numbers was extended to 21 600.

LaCaille and Marie both being dead, LaLande was requested to get out a new table and he decided to have it stereotyped so as to avoid errors which had crept into the earlier editions. Thus appeared the first edition of the tiny five-place table, *Tables de Logarithmes pour les Nombres et pour les Sinus, avec les explications et les usages principaux...*, Paris, 1805, xli, 196 p. 8 × 13.2 cm. (about  $3\frac{1}{8} \times 5\frac{1}{4}$  ins.). These are the only editions which appeared in LaLande's lifetime. Reprints of this latter occurred in 1816, 1825, and 1831. This last edition was reprinted anonymously in a volume of the Useful Knowledge Society, London, 1839, and reprinted 1854.

It was this 1831 edition, apparently, which was reprinted by A. A. L. REYNAUD in his *Trigonométrie rectiligne et Sphérique...*, third ed., *suivie des tables de logarithmes des nombres et les lignes trigonométriques de Jérôme de Lalande*, Paris, 1818. REYNAUD brought out a separate edition of the tables in 1828, xxviii, 203 p.; reprinted in 1838, 1839, 1840, 1851, 1852.

Rogg tells us that in 1824 the Hamburg Mathematical Society (the oldest in the world—see *Scripta Mathematica*, v. 1, p. 85–86, 1932) published a German edition, and remarks, as did DeMorgan, that it seems to be a table without error. Another German ed. by H. G. Köhler appeared at Leipzig, in 1827: *Jerome de la Lande's logarithmisch-trigonometrische Tafeln. Vermehrt durch die Tafeln der Gaussischen Logarithmen...*; second ed., 1832, xiv, 254 p.; third ed., Leipzig, verb. u. verm., 1849, xxxiv, 312 p.; other eds. 1865, 1868, 1870, and Brussels, 1844. A Spanish ed. published at Paris in 1843, was reprinted there in 1847 and at Paris and Madrid, 1864.

Next we may note *Tables de logarithmes, par Jérôme de LaLande étendue à sept décimales par F. C. M. MARIE* [1788–?], *précédées d'une instruction dans laquelle on fait connaître les limites des erreurs qui peuvent résulter de l'emploi des logarithmes des nombres des lignes trigonométriques*, par B<sup>on</sup> REYNAUD...*edition stereotype*, Paris, 1829, xlii, 204 p. Reprinted 1841, 1845, 1846, 1850, 1851.

*Nouvelle édition augmentée de formules pour la résolution des triangles*, Paris, 1854, xlii, 204, 32 p. Reprinted 1856, 1858, 1864, 1872, 1875, 1877, 1882, 1883, 1884, 1890, 1903, 1907, 1914, 1923, 1933, 1939. There was an Italian edition of this at Naples in 1913, xii, 208 p. Also an edition of 1854, xxviii, 236 p. Reprinted 1856, 1858, 1864, 1868, 1875, 1903; in the last three the introduction is signed by J. Houël.

Then there were editions of LaLande's tables by R. PICARTE, Paris, 1858, ix, 42 p. And by J. DUPUIS, Paris, 1856, xxiv, 131 p., reprinted 1857; second ed. Paris, 1859, xii, 191 p.; and this same, with addition of *les logarithmes d'addition et de soustraction*, Paris, 1860, was reprinted in 1862, 1868, and 1871. LaLande's tables were also in a collection of tables by J. F. D'AUBUISSON & P. SAINT-GUILHORN, Paris, 1842.

Practically every one of these editions is listed as in the Bibliothèque Nationale. The only volumes which I have handled are the edition of 1805, the German edition of 1849, and an edition of 1939.

#### ADRIEN MARIE LEGENDRE (1752–1833)

B. Paris. Prof. École Militaire and École Normale Supérieure, and examiner at the École Polytechnique. Won Berlin Academy prize for discussion of paths of projectiles in resisting media (1782); elected to math. section, Acad. Sci., Institut de France (1795, v. pres. 1804; pres. 1805); member of the committee to introduce the decimal system into France (compulsory 1801); associated with Prony in computing the *Tables du Cadastre* (see *MTAC*, v. 1, p. 34). Eminent mathematician achieving results of importance in the fields of theory of Numbers, Elliptic Functions, Gamma Functions, Attractions of



Ellipsoids, Geodesy, and Method of Least Squares, of which he was first to publish the method (1805). Author of *Exercices de Calcul Intégral*, [3 v. Paris, v. 1, 1811; v. 2 (p. 1–152, 1814, p. 153–312, 1815; completed v. 1817); v. 3, 1816; later referred to as *Exercices*]; and *Traité des Fonctions Élliptiques*, (3 v. Paris, 1826; later referred to as *Traité*). Also author of *Éléments de Géométrie... Traité de Trigonométrie* (Paris, 1794), appearing in many editions, in many languages, an English translation having been made, together with an introductory chapter on proportion, by THOMAS CARLYLE (for which he received £50), Edinburgh, 1824; there were numerous editions in America where the work led to the abandonment of Euclid's *Elements*. The first English translation was American, by JOHN FARRAR, Cambridge, Mass., 1819.

## PB

1. Portrait in the archives of the Acad. Sci., Institut de France.
2. BALL, v. A.  
The following four portraits are all of the same side-view which is also here reproduced on a Plate.
3. A. M. LEGENDRE, *Tables of the Logarithms of the Complete  $\Gamma$ -function to Twelve Figures* (*Tracts for Computers*, no. 4, ed. K. Pearson), Cambridge, 1921, facsimile of table, 10 p. Portrait plate frontispiece, with autograph.
4. D. E. SMITH, *History of Mathematics*, v. 1, Boston, 1923, p. 488; portrait after a lithograph by DELPECH; also facsimile of an autograph letter, p. 489.
5. A. M. LEGENDRE, *Tables of the Complete and Incomplete Elliptic Integrals reissued from Tome II of Legendre's Traité des Fonctions Elliptiques, Paris, 1825 [sic]. With an introduction by K. PEARSON*, Cambridge, 1934. xliii, 94 p. Portrait plate frontispiece, with autograph.
6. V. SANFORD, *Mathematics Teacher*, v. 26, 1935, p. 182–184; portrait frontispiece oppo. p. 137.

## B

1. J. W. L. GLAISHER, "Legendre, Adrien Marie," *Enc. Britannica*, v. 16, eleventh ed., Cambridge, 1911. [G. errs in attributing to Sir David Brewster the translation into English of Legendre's *Geometry*.] See also the article on "Spherical harmonics" by E. W. HOBSON in v. 25.
2. LÉONCE ÉLIE DE BEAUMONT, "Éloge historique de Adrien Marie Legendre," Acad. d. Sci., Paris, *Memoires*, v. 32, 1864, p. xxxvii–xciv, 56 p. English translation by C. A. ALEXANDER, Smithsonian Institution, *Report for 1867*, Washington, 1868, p. 137–157.
3. JACOB, *Nouvelle Biographie Générale*, v. 30, Paris, 1859, cols. 385–387.
4. POGGENDORFF 1, 1863; 4, 1904.
5. Institut de France, Acad. d. Sci., *Annuaire pour 1935*.
6. N. NIELSEN, *Géomètres Français sous la Révolution*, Copenhagen, 1929; "Legendre," p. 166–174.
7. D. E. SMITH, "Among my autographs, 29. Legendre and Cauchy sponsor Abel," *Amer. Math. Mo.*, v. 29, 1922, p. 394–395.
8. Facsimile of a Legendre ms., *J. f. d. reine u. angew. Math.*, v. 24, 1842.



9. I. TODHUNTER, *A History of the Progress of the Calculus of Variations during the Nineteenth Century*. Cambridge and London, 1861, p. 229–233, 489.
10. L. E. DICKSON, *History of the Theory of Numbers*. Washington, D. C., v. 1–3, 1919, 1920, 1927; see various references to Legendre in the indices. Also, New York, Stechert ed., 1935.
11. A. ENNEPER, *Elliptische Functionen. Theorie und Geschichte*. Halle, 1876; for references to Legendre, see synopsis, p. 538.
12. "Correspondance Mathématique avec Legendre," C. G. J. JACOBI, *Gesammelte Werke*, v. 1. Berlin, 1881, p. 385–461. Also in *J. f. d. reine u. angew. Math.*, v. 80, 1875, p. 205–279.
13. I. TODHUNTER, *History of the Mathematical Theories of Attraction and the Figure of the Earth*. London, 1873. In v. 2, chapters 20, 22, 24, 25, p. 20–139, contain full and complete accounts of Legendre's memoirs on attractions of ellipsoids.
14. M. MERRIMAN, "List of writings related to the method of least squares with historical and critical notes," *Connecticut Acad. Trans.*, v. 4, 1877, p. 160–173. For a translation of a portion of Legendre's "On the method of least squares," see *A Source Book in Mathematics*, ed. by D. E. SMITH. New York, 1929, p. 576–579. See also p. 112 f of this v. concerning "Legendre's law of quadratic reciprocity."
15. C. DORIS HELLMAN, "Legendre and the French reform of weights and measures," *Osiris*, v. 1, 1936, p. 314–340.
16. F. RUDIO, *Archimedes, Huygens, Lambert, Legendre. Vier Abhandlungen über die Kreismessung....* Leipzig, 1892, p. 157–166. [Proof that  $\pi$  and  $\pi^2$  are irrational, taken from Note IV of his *Éléments de Géométrie*.]
17. *The Thirteen Books of Euclid's Elements translated from the Text of Heiberg with Introduction and Commentary by T. L. HEATH*, v. 1. Cambridge, 1908, p. 112, 169, 213–219; second ed. revised with additions, 1926.
18. LAO G. SIMONS, "On the influence of French mathematicians... upon the teaching of mathematics in American colleges," *Isis*, v. 15, 1931, p. 107–115.
19. L. C. KARPINSKI, *Bibliography of Mathematical Works printed in America through 1850*. Ann Arbor, 1940, p. 11, 228–229, 292–293, 449, 459.
20. *Catalogue Général des Livres Imprimés de la Bibliothèque Nationale*, v. 93. Paris, 1928.
21. E. T. BELL, *The Development of Mathematics*, second ed. New York, 1945; many index references.

## T

- 1<sub>1</sub>. *Essai sur la Théorie des Nombres*. Paris, 1798, xxiv, 472 p. + twelve tables, p. [473–528].
- 1<sub>2</sub>. Second ed. Paris, 1808, 10 tables.
- 1<sub>3</sub>. Third ed. Paris, 1830, xxiv, 396 p. + 10 tables.
- 1<sub>4</sub>. Fourth ed. Paris, 1900, identical with 1<sub>3</sub>.
- 1<sub>5</sub>. *Zahlentheorie*, German translation of 1<sub>3</sub>, by H. MASER. Leipzig, 1886, v. 1, xxviii, 442 p.; tables p. 390–442.

- 1<sub>6</sub>. Second German ed., identical with 1<sub>5</sub>, except for title page dated 1893.

Tables of  $\Gamma(x+1)$ .

- 1<sub>1</sub>. *Exercices*, part 2, v. 1, 1811, p. 302–306;  $x = [0(.001)1; 7D]$ ; seventh place unreliable.
- 1<sub>2</sub>. J. L. F. BERTRAND, *Traité de Calcul Différentiel et de Calcul Intégral*. Paris, v. 2, 1870, p. 285–286.
- 1<sub>3</sub>. J. W. GLOVER, *Tables of Applied Mathematics*.... Ann Arbor, 1923, p. 464–467.
- 1<sub>4</sub>. L. POTIN, *Formules et Tables Numériques*. Paris, 1925, p. 837–838.
- 1<sub>5</sub>. F. E. FOWLE, ed., *Smithsonian Physical Tables*, eighth rev. ed., first reprint. Washington, 1934, p. 64–65.
- 2<sub>1</sub>. *Exercices*, part 4, v. 2, 1814, p. 37; *Traité*,  $x = [-1(1/12) + 1; 14D]$ .
- 2<sub>2</sub>. A. DEMORGAN, *The Differential and Integral Calculus*. London, 1842, p. 590.
- 2<sub>3</sub>. O. X. SCHLÖMILCH, *Analytische Studien*, part 1. Leipzig, 1848, p. 171.
3. *Traité*, v. 2, 1826, p. 456,  $x = [-7/8(1/4) + 7/8; 14D]$ .
- 4<sub>1</sub>. *Exercices*, part 4, 1814, p. 85–95; *Traité*, v. 2, 1826, p. 489–499,  $x = [0(.001)1; 12D]$ ,  $\Delta^3$ .
- 4<sub>2</sub>. Pearson facsimile print, 1921; see PB 3.
- 4<sub>3</sub>. Reprinted in O. X. SCHLÖMILCH, *Analytische Studien*, part 1. Leipzig, 1848, p. 183–209.
- 4<sub>4</sub>. H. T. DAVIS, *Tables of the Higher Mathematical Functions*, v. 1. Bloomington, Indiana, 1933, p. 195–237.
- 4<sub>5</sub>. Abridgement in A. DEMORGAN, ... *Calculus*, 1842, p. 587–589.
- 4<sub>6</sub>. Abridgement in G. S. CARR, *A Synopsis of Elem. Results in Pure Mathematics*. London, 1886,  $x = [0(.001)1; 7D]$ .

Tables of  $S_n$

- 1<sub>1</sub>. *Exercices*, v. 2, 1814, p. 65; *Traité*, v. 2, 1826, p. 432, [ $n = 2(1)35; 16D$ ]. Among reprints of this table are the following:
- 1<sub>2</sub>. A. DE MORGAN, ... *Calculus*, 1842, p. 554.
- 1<sub>3</sub>. C. W. MERRIFIELD, R. So. London, *Proc.*, v. 33, 1881, p. 8.
- 1<sub>4</sub>. J. P. GRAM, K. Danske Vidensk. Selskab, *Skrifter*, s. 6, v. 2, no. 6, p. 269.
- 1<sub>5</sub>. F. W. NEWMAN, *The Higher Trigonometry*. Cambridge, 1892, p. 38; see MTAC, v. 1, p. 456–457, where Legendre errors are noted.
- 1<sub>6</sub>. J. EDWARDS, *A Treatise on the Integral Calculus*, v. 2. London, 1922, p. 144.

Tables of  $K(\theta)$  and  $E(\theta)$

- 1<sub>1</sub>. *Exercices*, v. 3, 1816, p. 342–344; *Traité*, v. 2, 1826, p. 288–290,  $\theta = [0(1^\circ)90^\circ; 12D]$ ,  $\Delta^6$  to  $45^\circ$ , then  $\Delta$ .
- 1<sub>2</sub>. Abridgement in H. MOSELEY, "Definite integrals," *Enc. Metrop.*, v. 2. London and Glasgow, 1845, p. 520; no differences.
- 1<sub>3</sub>. A. M. Legendre's *Tafeln der elliptischen Normalintegrale erster und zweiter Gattung*, ed. by F. EMDE. Stuttgart, 1931, facsimile of p. 342–344 (p. 6–8). See MTAC, v. 2, p. 136–137, 181.

Tables of  $\log K(\theta)$  and  $\log E(\theta)$



- 1<sub>1</sub>. *Exercices*, v. 3, 1816, p. 125–147; *Traité*, v. 2, 1826, T. I, p. 221–243;  $\theta = [0(0^\circ.1)15^\circ$  and  $75^\circ (0^\circ.1)90^\circ$ ; 14D],  $[15^\circ(0^\circ.1)75^\circ$ ; 12D], but  $\Delta^3$  to  $70^\circ$ , and then  $\Delta^4$ , are those corresponding to 12D values.
- 1<sub>2</sub>. Pearson's facsimile reprint, 1934; see PB 5, p. 1–22.
- 2<sub>1</sub>. *Exercices*, v. 1, 1811, p. 118,  $\theta = [0(1^\circ)90^\circ$ ; 7D].

Table of  $\log (2K/\pi)$ 

1. *Exercices*, v. 3, 1816, p. 323–332; *Traité*, 1826, T. 6, p. 269–278;  $x = [0(0^\circ.1)15^\circ(0^\circ.5)45^\circ$ ; 14D].

Tables of  $F(\theta, \phi)$  and  $E(\theta, \phi)$ 

- 1<sub>1</sub>. *Exercices*, v. 3, 1816, p. 345–416; *Traité*, v. 2, 1826, p. 291–363, T. 9;  $\theta = [0(1^\circ)45^\circ$ ; 10D],  $[45^\circ(1^\circ)90^\circ$ ; 9D],  $\phi = 0(1^\circ)90^\circ$ .  
For errata see N. SAMOÏLOVA-ÎAKHONTOVA, *Tablitsy Ellipticheskikh Integralov*. Moscow and Leningrad, 1935, p. 6 (see *Scripta Mathematica*, v. 3, 1935, p. 365); C. A. HEUMAN, *J. Math. Phys.*, v. 20, 1941, p. 143–144 (see *MTAC*, v. 1, p. 187). Some errors of the 1826 table do not occur in the 1816 table; see *MTAC*, v. 2, p. 136–137.
- 1<sub>2–4</sub>. Facsimile reprints: 1816 table—(i) L. POTIN, *Formules et Tables Numériques*. Paris, 1925, p. 754–827; (ii) EMDE, 1931, p. 9–81. 1826 table—(i) PEARSON, 1934, p. 23–94. See *MTAC*, v. 2, p. 136–137, 181.
- 2<sub>1</sub>. *Exercices*, v. 3, 1816, p. 338–344; *Traité*, v. 2, 1826, p. 284–290, T. 8;  $\theta = [0(1^\circ)90^\circ$ ; 12D],  $\phi = 45^\circ$ ,  $\Delta^5$  or  $\Delta^6$ .
- 2<sub>2</sub>. Facsimile reprint, EMDE, 1931, p. 1–8.
3. *Exercices*, v. 3, 1816, p. 84–87; *Traité*, v. 2, 1826, p. 77–80;  $\phi = 89^\circ$ ,  $\theta = [0(0^\circ.5)90^\circ$ ; 10D],  $\Delta$ .
- 4<sub>1</sub>. *Exercices*, v. 3, 1816, p. 148–155; *Traité*, v. 2, 1826, p. 244–251, T. 2;  $\theta = 45^\circ$ ,  $\phi = [0(0^\circ.5)90^\circ$ ; 12D],  $\Delta^n$ .
- 4<sub>2</sub>. Abridgement in G. GREENHILL, *The Applications of Elliptic Functions*. London, 1892, p. 11, F ( $\theta, \phi$ ) to 5D, and no  $\Delta$ .

## Miscellaneous

- T. 3–5 in *Exercices*, v. 3, 1816, p. 156–171; *Traité*, v. 2, 1826, p. 252–267 are tables of (a)  $\sin x$ ,  $x = [0(15')45^\circ$ ; 15D] and of  $\log \sin x$ ,  $x = [0(15')45^\circ$ ; 14D]; (b)  $\ln \tan (45^\circ + \frac{1}{2}x)$ ,  $x = [0(30')90^\circ$ ; 12D],  $\Delta^5$ ; (c)  $\log N$ ,  $N$  odd, 1163–1501, and all prime numbers from 1501 to 10000.

In discussion of gamma functions there are also tables in *Traité*, v. 2, 1826, p. 516, 520–521.

DERRICK HENRY LEHMER (1905– )

B. Berkeley, California. A.B. Univ. California (1927); Brown Univ. M.Sc. (1929), Ph.D. (1930); National Research Council fellow (1930–32); research worker Institute for Adv. Study (1933–34); prof. math. Lehigh Univ. (1937–38; 1939–40); Guggenheim fellow (1938–39); prof. math. Univ. California, Berkeley, since 1940. On leave of absence at the Ballistic Research Laboratory, Aberdeen Proving Ground, Md. (1945–46).

## PB

1. *Scripta Mathematica*, v. 4, 1936, p. 331–332, with bibl. + portrait on plate.
2. See plate (1936, same as in no. 1).

## B

1. *Amer. Men of Science*, seventh ed., Lancaster, Pa., 1944; starred.

## T

1. "Table of cube and fifth-roots," *Amer. Math. Mo.*, v. 32, 1925, p. 379.
2. "A list of errors in tables of the Pell equation," *Amer. Math. So., Bull.*, v. 32, 1926, p. 548–550.
3. "The mechanical combination of linear forms," *Amer. Math. Mo.*, v. 35, 1928, p. 121.
4. "On the multiple solution of the Pell equation," *Annals of Math.*, s. 2, v. 30, p. 72, 1928.
5. (with Emma T. Lehmer) *Waring Table of Fourth Powers*, Berkeley, 1928, 436 p. mimeographed. An edition of 10 copies only.
6. "On the factorization of Lucas' functions," *Tôhoku Math. J.*, v. 34, 1931, p. 2–3.
7. "Lacunary recurrence formulas for the numbers of Bernoulli and Euler," *Annals of Math.*, s. 2, v. 36, 1935, p. 644–649.
8. "An extension of the table of Bernoulli numbers," *Duke Math. J.*, v. 2, 1936, p. 462–464.
9. "On a conjecture of Ramanujan," *London Math. So., J.*, v. 11, 1936, p. 117–118.
10. "On the converse of Fermat's theorem," *Amer. Math. Mo.*, v. 43, 1936, p. 349–351.
11. "On the function  $x^2 + x \neq A$ ," *Sphinx*, v. 6, 1936, p. 213.
12. "On maxima and minima of Bernoulli polynomials," *Amer. Math. Mo.*, v. 47, 1940, p. 538.
13. *Guide to Tables in the Theory of Numbers* (Nat. Research Council, *Bull.*, no. 105), Washington, D. C., 1941, xiv, 177 p.
14. "Ramanujan's function  $\tau(n)$ ," *Duke Math. J.*, v. 10, 1943, p. 483–492; see *MTAC*, v. 1, p. 183f.

## DERRICK NORMAN LEHMER (1867–1938)

B. Somerset, Indiana. A.B. (1893), A.M. (1896), hon. D.Sc. (1932) Univ. Nebraska; Ph.D. Univ. Chicago (1900); prof. math. Univ. California (1904–38); for a decade editor of a literary magazine, *University of California Chronicle*; author of many poems widely published in periodicals and anthologies in the United States and England; president of the California Writers' Club (1932); for a score of years while among Indians of the West he made hundreds of valuable records of their songs, a number of collections of which were published; his two Indian operas were performed in 1933 and 1935.

## PB

1. ADELINE F. SEE, "Gathering the music of the red men for posterity," *Musical America*, v. 44, Apr. 24, 1926, p. 5 (portrait and story).



2. "Regarding East Bay musicians," *Pacific Coast Musical Rev.*, v. 57, Nov. 4, 1933, p. 17 (portrait)—18.
3. See plate (1936).
4. Portrait of Professor and Mrs. Lehmer, *Oakland Tribune*, 8 Sept. 1938.
5. *Nat. Cycl. Amer. Biog.*, New York, v. 28, 1940, p. 78–79 + portrait plate.

## B

1. Circolo Mat. d. Palermo, *Annuario Biografico*, 1914.
2. *Amer. Men of Science*, sixth ed., New York, 1938; starred since the second ed.
3. *Who's Who in America*, v. 20, 1938–39, Chicago, 1938; *Who Was Who in America*, Chicago, 1942.
4. *University of California, In Memoriam 1938*, Berkeley, Cal., 1938, p. 19–20.
5. R. C. ARCHIBALD, "Mathematicians, and poetry and drama," *Science*, n. s., v. 89, 1939, p. 21–22.
6. T. M. Putnam, *Amer. Math. So., Bull.*, v. 45, 1939, p. 209–212, with bibl. of his math. publications.

## T

1. *Factor Table for the First Ten Millions, containing the smallest Factor of every Number not divisible by 2, 3, 5 or 7, between the Limits 0 and 10017000*. Washington, D. C., Carnegie Institution, 1909.
2. *List of Prime Numbers from 1 to 10,006,721*, Carnegie Institution, 1914.
- 3<sub>1</sub>. *Factor Stencils*, Carnegie Institution, 1929, 27 p. + 295 stencils.
- 3<sub>2</sub>. *Factor Stencils*, revised and extended by J. D. ELDER, Carnegie Institution, 1939, 27 p. + 2135 stencils.

## ALFRED LODGE (1854–1937)

B. Penkhalls, Staffs., England. Professor of pure mathematics, Royal Indian Engineering College, Coopers Hill (1884–1904); assistant mathematical master of Charterhouse (1904–1919); first president of the Mathematical Association (1897–98). Brother of Sir OLIVER LODGE (1851–1940) and of Sir RICHARD LODGE (1855–1936).

## P

1. *Math. Gazette*, v. 14, 1929, oppo. p. 394.

## B

1. *The Times*, London, 6 Dec. 1937, p. 14.
2. C. O. TUCKEY, *Math. Gazette*, v. 22, 1938, p. 3–4.
3. *Nature*, v. 141, Jan. 29, 1938, p. 191; Feb. 12, p. 290.
4. *POGGENDORFF* 6, 1938.
5. *Who's Who*, London, 1938; *Who Was Who 1929–1940*, London, 1941.
6. *MTAC*, 1944, v. 1, p. 75, 167.

## T

1. *Bremiker's Tables of the Common Logarithms of Numbers...Tenth stereotyped edition with an Appendix [by A. Lodge] containing a*

*Table of Natural Functions and Circular Measures of Angles to each Minute of Arc to five places of decimals*, London, 1887, 45 p. See *MTAC*, v. 2, p. 161.

- 2<sub>1</sub>. Tables of  $I_n(x)$ ,  $n = 1(1)11$ , B.A.A.S., *Report*, 1889, p. 28–32.
- 2<sub>2–3</sub>. Reprinted in first and second editions of GRAY & MATHEWS, *Treatise on Bessel Functions*, London, 1895, T. VI; and 1922, T. IX.
- 3<sub>1</sub>. Tables of  $\text{ber } x$ ,  $\text{bei } x$ ,  $I_1(x)$ , B.A.A.S., *Report*, 1893, p. 227–279.
- 3<sub>2–3</sub>. Abridged in GRAY & MATHEWS, 1895, T. IV–V; 1922, T. VI–VIII.
- 4<sub>1</sub>. Tables of  $I_0(x)$ , B.A.A.S., *Report*, 1896, p. 99–149.
- 4<sub>2</sub>. Abridged in GRAY & MATHEWS, 1922, T. VII.
5. “Tables of zonal harmonics,” R. So. London, *Trans.*, v. 203A, 1904, p. 100–110.
6. “Further tabulation of Bessel functions,” B.A.A.S., *Report*, 1907, p. 94–95; and 1909, p. 33–36.
- 7<sub>1</sub>. “The tabulation of the summation function for harmonic series,” B.A.A.S., *Report*, 1929, p. 251–262.
- 7<sub>2</sub>. BAASMTTC, *Mathematical Tables*, v. 1, *Circular and Hyperbolic Functions . . . Factorial (Gamma) and Derived Functions. Integrals of Probability Integral*. London, 1931, 1946, T. XI, “Digamma function.”
8. BAASMTTC, *Mathematical Tables*, v. 1, . . . London, 1931, 1946, T. XII, “Trigamma function,” T. XIII, “Tetragamma function,” T. XIV, “Pentagamma function” (with J. Wishart).
9. BAASMTTC, *Mathematical Tables*, v. 5, *Factor Table giving the complete Decomposition of all Numbers less than 100,000, Prepared independently by J. Peters, A. Lodge, E. J. Ternouth, E. Gifford . . .*, London, B.A.A.S., 1935, xvi, 291 p.

#### WILHELM OSWALD LOHSE (1845–1915)

B. Leipzig, Germany. Observer at the Potsdam astrophysical observatory from 1874.

#### PB

1. *Porträtgalerie* 1904.

#### B

1. POGGENDORFF 3, 1897; 4, 1904; 5, 1926.
2. *Who's Who in Germany. Wer ist's*, seventh ed. Leipzig, 1914.
3. P. F. F. KEMPF, *Astron. Ges., Vierteljahrs.*, v. 50, 1915.

#### T

- 1<sub>1</sub>. *Tafeln für numerisches Rechnen mit Maschinen*. Leipzig, 1909.
- 1<sub>2</sub>. Second ed., neugearbeitet, by P. V. NEUGEBAUER. Leipzig, 1935, vi, 113 p.

#### EUGEN CORNELIUS JOSEPH VON LOMMEL (1837–1899)

B. Edenkoben, Pfalz, Germany. Prof. physics Univ. Munich; Rektor (1899).



## PB

1. *Illustrierte Zeitung*, v. 112, 29 June 1899, p. 874.
2. L. BOLTZMANN, Deutsche Math.-Ver., *Jahresb.*, v. 8, 1900, p. 47-58, with bibl.

## B

1. POGGENDORFF 3, 1897; 4, 1904.
2. C. VOIT, Bay. Akad. d. Wissen., Munich, *Sitz.*, v. 30, 1900, p. 324-339.

## T

1. "Über die Anwendung d. Bessel'schen Functionen in d. Theorie d. Beugung," *Z. Math. Phys.*, v. 15, 1870, various tables, p. 151-155, 164-169.
- 2<sub>1</sub>. "Die Beugungserscheinungen einer kreisrunden Oeffnung und eines kreisrunden Schirmchens theoretisch und experimentell bearbeitet," and "Die Beugungserscheinungen geradlinig begrenzter Schirme," Bayer. Akad. d. Wissen., *math. naturw. Abt., Abh.*, v. 15, 1886, various tables, p. 312-328, 644-651, mostly tables of Bessel functions and Lommel functions. See under Lommel, *MTAC*, index to v. 1.
- 2<sub>2</sub>. There are the following reprints of some of Lommel's tables: (1) RAYLEIGH, *Phil. Mag.*, s. 5, v. 31, 1891, p. 94 and *Scientific Papers*, v. 3, 1902, p. 434-435. (2) G. N. WATSON, *Treatise on the Theory of Bessel Functions*, 1922 and 1944; T. IV, p. 730-732,  $J_n(x)$ ; T. V, p. 740-745,  $J_{\pm(n+\frac{1}{2})}(x)$  and Fresnel integrals with some modifications and corrections.

## ARNOLD NOAH LOWAN (1898- )

B. Jassy, Roumania. Graduated as chemical engineer Polytechnic Institute of Bucharest (1924); came to America (1924, and naturalized 1929); M.Sc. New York Univ. (1929); Ph.D. Columbia Univ. (1934); research physicist Combustion Utilities Corp., Linden, N. J. (1928-31); successively instr., assist. prof., assoc. prof., and prof. (1943) physics, Yeshiva College, since 1934; technical director Mathematical Tables Project, and successors, since 1938.

## P

1. See platè (1945).

## B

1. *Who's Who Monthly Suppl.*, s. 4, p. 73, Apr. 1943.
2. *Am. Men of Science*, seventh ed., Lancaster, Pa., 1944.

## T

MTP indicates volumes prepared by the Mathematical Tables Project under Lowan's direction.

1. (MTP) *Table of the First Ten Powers of the Integers from 1 to 1000*. Washington, D. C., 1938. 80 p.
2. (MTP) *Tables of the Exponential Function  $e^x$* , Washington, D. C., 1939, xviii, 535 p.
3. (MTP) *Tables of Circular and Hyperbolic Sines and Cosines for Radian Arguments*, Washington, D. C., 1939. xviii, 405 p.

4. (MTP) *Tables of Sines and Cosines for Radian Arguments*, Washington D. C., 1940. 275 p.
5. (MTP) *Tables of Sine, Cosine and Exponential Integrals*, 2 v., Washington, D. C., 1940. xxviii, 444 p. + xxxviii, 225 p.
6. (with G. BLANCH, R. E. MARSHAK, & H. A. BETHE) "The internal temperature-density distribution of the sun," *Astrophys. J.*, v. 94, 1941, p. 37-45. [Tables of stellar functions for point-source models.]
7. (MTP) *Tables of Natural Logarithms*, 4 v., Washington, D. C., 1941. xviii, 501 p. + xviii, 501 p. + xviii, 501 p. + xxii, 506 p.
8. (MTP) *Tables of the Moment of Inertia and Section Modulus of Ordinary Angles, Channels, and Bulb Angles, with Certain Plate Combinations*, Washington, D. C., 1941. xiii, 197 p.
9. (MTP) *Miscellaneous Physical Tables. Planck's Radiation Functions and Electronic Functions*, Washington, D. C., 1941. viii, 58 p.
10. (MTP) *Tables of Probability Functions*, 2 v., Washington, D. C., 1941-1942. xxxviii, 302 p. + xxii, 344 p.
11. (with N. DAVIDS & A. LEVENSON) "Table of the zeros of the Legendre polynomials of order 1-16 and the weight coefficients for Gauss' mechanical quadrature formula," *Am. Math. So., Bull.*, v. 48, 1942, p. 739-743.
12. (MTP) *Table of Sine and Cosine Integrals for Arguments from 10 to 100*, Washington, D. C., 1942. xxxii, 185 p.
13. (MTP) *Table of Arc Tan x*, Washington, D. C., 1942. xxvi, 169 p.
14. (with W. HORENSTEIN) "On the function  

$$H(m, a, x) = \exp(-ix)F(m+1-ix, 2m+2; 2ix),"$$
*J. Math. Phys., M.I.T.*, v. 21, 1942, p. 273-283. See *MTAC*, v. 1, p. 156.
15. (with H. E. SALZER & A. HILLMAN) "A table of coefficients for numerical differentiation," *Amer. Math. So., Bull.*, v. 48, 1942, p. 920-924.
16. (MTP) U. S. War Dept., *Technical Manual. Coordinate Conversion Tables*, no. TM4-238, Washington, D. C., Superintendent of Documents, 1943. 338 p.
17. (MTP) *Table of Circular and Hyperbolic Tangents and Cotangents for Radian Arguments*, New York, Columbia Univ. Press, 1943. xxxviii, 410 p. See *MTAC*, v. 1, p. 178f.
18. (MTP) *Table of Reciprocals of the Integers from 100 000 through 200 009*, New York, Columbia Univ. Press, 1943. viii, 201 p. See *MTAC*, v. 1, p. 176f.
19. (MTP) *Table of the Bessel Functions  $J_0(z)$  and  $J_1(z)$  for Complex Arguments*, New York, Columbia Univ. Press, 1943. xlv, 403 p.
20. (with M. ABRAMOWITZ), "Tables of integrals  $\int_0^x J_0(t)dt$  and  $\int_0^x Y_0(t)dt$ ," *J. Math. Phys., M.I.T.*, v. 22, 1943, p. 2-12. See *MTAC*, v. 1, p. 154.
21. (with H. E. SALZER) "Table of coefficients in numerical integration formulae," *J. Math. Phys., M.I.T.*, v. 22, 1943, p. 49-50.
22. (with G. BLANCH & M. ABRAMOWITZ) "Table of  $J_0(x) = \int_x^\infty J_0(t)dt/t$  and related functions," *J. Math. Phys.*, v. 22, 1943, p. 51-57. See *MTAC*, v. 1, p. 155.



23. (with J. LADERMAN) "Table of Fourier coefficients," *J. Math. Phys.*, v. 22, 1943, p. 136–147. See *MTAC*, v. 1, p. 192f.
24. (with A. HILLMAN), "A short table of the first five zeros of the transcendental equation  $J_0(x) Y_0(kx) - J_0(kx) Y_0(x) = 0$ ," *J. Math. Phys.*, M.I.T., v. 22, 1943, p. 208–209.
25. (MTP) "Table of  $f_n(x) = [n!/(x/2)^n] J_n(x)$ ," *J. Math. Phys.*, M.I.T., v. 23, 1944, p. 45–60. See *MTAC*, v. 1, p. 363f.
26. (with H. E. SALZER) "Coefficients for interpolation within a square grid in the complex plane," *J. Math. Phys.*, v. 23, 1944, p. 156–166.
27. (with H. E. SALZER) "Formulas for complex interpolation," *Quart. Appl. Math.*, v. 2, 1944, p. 272–274.
28. (MTP) *Tables of Lagrangian Interpolation Coefficients*, New York, Columbia Univ. Press, 1944. xxxii, 390 p. See *MTAC*, v. 1, p. 314f.
29. (MTP) War Department, Corps of Engineers, *Hydraulic Tables*, second ed., Washington, D. C., Govt. Printing Office, 1944. viii, 565 p.
30. (MTP) *Tables of Associated Legendre Functions*, New York, Columbia Univ. Press, 1945. xlvi, 306 p. See *MTAC*, v. 2, p. 79f.
31. (MTP) *Table of Arc Sin x*, New York, Columbia Univ. Press, 1945. xix, 124 p. See *MTAC*, v. 2, p. 21.
32. (MTP) *Table of Characteristic Values of Mathieu's Differential Equation*. Prepared for the Applied Mathematics Panel of the National Defense Research Committee. New York, 1945. xxiv, 39 p. See *MTAC*, v. 2, p. 77f.
33. (with H. E. SALZER) "Tables of coefficients for numerical integration without differences," *J. Math. Physics*, v. 24, 1945, p. 1–21.
34. (MTP) *Table of Fractional Powers*, New York, Columbia Univ. Press, 1946. xxx, 489 p. See *MTAC*, v. 2, p. 205f.
35. (MTP) *High Latitude Celestial Navigaton Tables*, Washington, D. C. 1946. vi, 337 p.
36. (MTP) *Spherical Bessel Functions*, v. 1. New York, Columbia Univ. Press, 1947. xxviii, 378 p. See *MTAC*, v. 2, p. 308f.

#### ANDREĬ ANDREEVICH MARKOV (1856–1922)

B. Rîazan', Russia. Doctorate Univ. St. Petersburg (1884); member of the Academy of Sciences; prof. Univ. Leningrad (1886–1907), emeritus prof. after 1907; joint editor of the collected works of P. L. CHEBYSHEV (1899–1907). His brother VLADIMIR (1871–1897) also a most gifted mathematician, and his son ANDREĬ is prof. math., Univ. Leningrad.

#### PB

1. M. RIESZ, *Acta Mathematica 1882–1912, Table Générale des Tomes*, 1–35, Stockholm, 1913, p. 86f, 158.
2. A. A. MARKOV, *Ischislenie veroiâtnostei* [calculus of probability], fourth ed. revised by the author, Moscow 1924 contains portrait frontispiece and a memoir by A. S. BESICOVITCH, p. III–XIV. Table of  $(2/\pi^{1/2}) \int_0^x e^{-t^2} dt$ , p. 582–588.
3. *Biometrika*, v. 4, Nov. 1932, frontispiece, portrait series no. IX.

## B

1. FOGGENDORFF 3, 1898; 4, 1904; 5, 1926; 6, 1938.
2. Akad. Nauk S.S.S.R., Leningrad, *Bulletin*, V. A. STEKLOV, v. 16, 1922, p. 169–184; J. V. USPENSKY, "The scientific work of Markov," v. 17, 1923, p. 19–34; N. M. GÜNTHER, "The pedagogical work of Markov," v. 17, 1923, p. 35–44; A. S. BESICOVITCH, "Markov and the calculus of probability," v. 17, 1923, p. 45–52.
3. *Scripta Mathematica*, v. 1, 1933, p. 357–358.

## T

1. *Table des valeurs de l'intégrale  $\int_x^\infty e^{-t^2} dt$* , St. Petersburg, 1888, xxvii, 98 p.
- 2<sub>1</sub>. As in PB 2, 1924; also another table p. 568–569.
- 2<sub>2</sub>. Both tables also in third ed., 1913. The supplement to this ed. was printed separately as: *Bicentenaire de la loi des grands nombres 1713–1913. Démonstration du second Théorème—limite du Calcul des Probabilités par la méthode des Moments*, St. Petersburg, 1913; tables, p. 58–59.
- 2<sub>3</sub>. German transl. of second Russian ed.: *Wahrscheinlichkeitsrechnung...* VON H. LIEBMANN, Leipzig and Berlin, 1912; table of  $(2/\pi^{1/2}) \int_0^x e^{-t^2} dt$ , p. 312–317.
- 2<sub>4–5</sub>. Second Russian ed., 1908; first ed., 1900; the same table as in 2<sub>3</sub>.
3. "Tables des formes quadratiques ternaires indéfinies ne représentant pas zéro pour tous les déterminants positifs  $D \leq 50$ ," Akad. Nauk S.S.S.R., Leningrad, *Cl. phys.-math., Mémoires*, s. 8, v. 23, no. 7; 1909, 22 p. Recomputed and extended to  $D \leq 83$  by A. E. ROSS, see L. E. DICKSON, *Studies in the Theory of Numbers*, Chicago, 1930, p. 150–151.

## ARTEMAS MARTIN (1835–1918)

B. Steuben Co., New York, U.S.A. Mainly self-educated; earlier years devoted to wood-chopping, oil-well drilling, farming, and teaching; librarian (1885), and later computer in the U. S. Coast and Geodetic Survey; edited and published *The Mathematical Visitor* (1877–95) and *Mathematical Magazine* (1882–1913) for which he did all the typesetting himself and printed some of the numbers; hon. A.M. Yale Univ. (1877), Ph.D. Rutgers Univ. (1882). Mathematical Library bequeathed to American Univ., Washington, D. C., where he also endowed the Artemas Martin Lectureship in Mathematics.

## PB

1. B. F. FINKEL, *Amer. Math. Mo.*, v. 1, 1894, p. 109–111 + por. pl.
2. *Illustrated Buffalo Express*, Feb. 12, 1899.
3. B. F. Finkel, *Mathematical Solution Book*, fourth ed., rev. and enl., Springfield, Mo., 1902, p. 484–485 + portrait plate.
4. *Nat. Cycl. Amer. Biog.*, v. 2. New York, 1921, p. 180.

## B

1. *Amer. Men Sci.*, second ed. New York, 1910.
2. Circolo Matem. d. Palermo, *Annuario Biografico*, 1914.
3. *Who's Who in America*, v. 10, 1918–1919, Chicago, 1918.



4. H. A. MARMER, *Dict. Amer. Biog.*, v. 12. New York, 1933.

## T

1. "About square numbers whose sum is a square number," *Math. Mag.*, v. 2, p. 69-76, 1891; p. 89-96, 1892; p. 137-140, 1893; see also p. 209-220, 1898; p. 361-396, 1913.
2. "About cube numbers whose sum is a cube number," *Math. Mag.*, v. 2, p. 153-160, 1895; p. 185-190, 1896.
3. "About biquadrate numbers whose sum is a biquadrate," *Math. Mag.*, v. 2, p. 173-184, 1896; p. 325-352, 1910.
4. "About fifth-power numbers whose sum is a fifth power," *Math. Mag.*, v. 2, p. 201-208, 1898.
5. "About sixth-power numbers whose sum is a sixth power," *Math. Mag.*, v. 2, p. 265-271, 1904.
6. "Rational scalene triangles," *Math. Mag.*, v. 2, p. 275-284, 1904.
7. "Table of prime rational right-angled triangles," *Math. Mag.*, v. 2, p. 301-308, 322-323, 1910.
8. "On rational right-angled triangles," Intern. Congress Mathems., Cambridge, Engl., *Proc.*, v. 2, Cambridge, 1912, p. 57-58.

## JEFFREY CHARLES PERCY MILLER (1906- )

B. Isleworth, near Hounslow, Middlesex Co., England. Univ. Cambridge B.A. (1928), M.A. (1931), Ph.D. (1933), first class honors—math. Tripos, part I (1926), wrangler—math. Tripos, part II (1928), Tyson medal for astronomy (1928), Sheepshanks exhibition for astronomy (1929), Isaac Newton studentship (1930), Rayleigh prize (1931); research on stellar constitution under Eddington (1928-31); in computing department Imperial College of Science and Technology (1931-35); lecturer in applied math., Univ. Liverpool 1935-June 1947; technical director of Scientific Computing Service, London (see under Comrie) from Jan. 1947. On BAASMTTC since 1933; secretary since Feb. 1946.

## P

1. See plate (1943).

## B

1. See *MTAC*, p. 209, 236, 239, 252, 272, 276, 278, 280, 283, 284, 296, 299, 304, 312, 321, 325, 334, 335, 431; also v. 2, p. 13, 14, 22-24, 33, 34, 38, 46, 47, 49-51, 57, 62, 63, 65, 87, 136, 148, 175, 178, 179, 181, 193, 207, 227, 262, 266, 267, 272, 277, 278, 284, 287, 290, 302, 304, 305, 308, 311, 315, 319

## T

1. BAASMTTC, *Mathematical Tables*, v. 2, *Emden Functions, being Solutions of Emden's Equation together with certain associated Functions* [integrations by J. C. P. Miller for the values  $n = 1\frac{1}{2}, 2, 3$ ], London, British Assoc., 1932.
2. "The effect of distribution of density on the period of pulsation of a star," R. A. S., *Mo. Not.*, v. 90, 1929; table p. 64.

3. (with L. ROSENHEAD), "Electrosmosis between plane parallel walls produced by high-frequency alternating currents," R. Soc. London, *Proc.*, v. 163A, 1937; tables p. 306, 310, 313.
- 4<sub>1</sub>. *Tables for Converting Rectangular to Polar Coordinates*, London, 1939.
- 4<sub>2</sub>. Reprinted 1941.
- 4<sub>3</sub>. Amer. ed., New York, Dover Publications, 1944.
5. "On a criterion for oscillatory solutions of a linear differential equation of the second order," Cambr. Phil. Soc., *Proc.*, v. 36, 1940; table p. 286-287.
6. BAASMTTC, *Mathematical Tables*, v. 9, *Table of Powers, giving integral powers of integers. Initiated by J. W. L. Glaisher, extended by W. G. Bickley, C. E. Gwyther, J. C. P. Miller, E. J. Ternouth.* Introduction and Bibliography by J. C. P. MILLER, edited by J. C. P. MILLER, Cambridge, Univ. Press, 1940. See *MTAC*, v. 1, p. 355f.
7. (with W. G. BICKLEY) "Numerical differentiation near the limits of a difference table," *Phil. Mag.*, s. 7, v. 33, 1942, p. 1-14 + 8 tables on 4 folding sheets. See *MTAC*, v. 1, p. 53f.
8. "Four-point Lagrangean interpolation coefficients for unknown fractions of the interval," *Math. Tables and Other Aids to Computation*, v. 2, 1946, p. 56-57. See also *Math. Gazette*, v. 30, 1946, p. 51.
9. (with A. FLETCHER and L. ROSENHEAD), *An Index of Mathematical Tables*, London, 1946. viii, 451 p. See *MTAC*, v. 2, p. 13-18, 136, 178-181, 219-220, 277-278.
10. BAASMTTC, *Mathematical Tables*, part-volume B, *The Airy Integral giving Solutions of the Differential Equation  $y'' = xy$* . Cambridge, University Press, 1946, 56 p. See *MTAC*, v. 2, p. 302f.

### JOHN NAPIER (1550-1617)

B. Merchiston Castle, Edinburgh, Scotland. During his life-time famed for his *A Plaine Discovery of the Whole Reuelation of Saint Iohn*:... (1593), of which there were later 4 other English editions, as well as 2 in Dutch, 5 in French, and 3 in German. Took up mathematical investigations as recreation. "The famous inventor of the logarithms, the person to whom the title of a GREAT MAN is more justly due than to any other whom his country ever produced" (DAVID HUME, *History of England*, new ed. London, v. 7, 1782, chapt. LVIII, p. 44). Worked on logarithms as early as 1594 and published (1614) a volume, *Mirifici Logarithmorum Canonis Descriptio*, text and tables, followed by a posthumous *Mirifici Logarithmorum Canonis Constructio* (1619). Knowledge of the use of logarithms which spread in the scientific world was entirely due to Napier. One of the first to use the decimal point in arithmetic (over 200 cases of its use in the *Constructio*). Author also of *Rabdologiæ* (1617), appearing in English, Latin, Italian, and Dutch editions, dealing with computation by Napier's rods or "bones." Also author of *De Arte Logistica* (published posthumously in 1839) a treatise on computation, arithmetic, geometry, and algebra. His eldest son raised to the rank of baron in 1627, under the title of Lord Napier.





A. N. LOWAN 1945







J. C. P. MILLER AND HIS SON, DAVID 1943



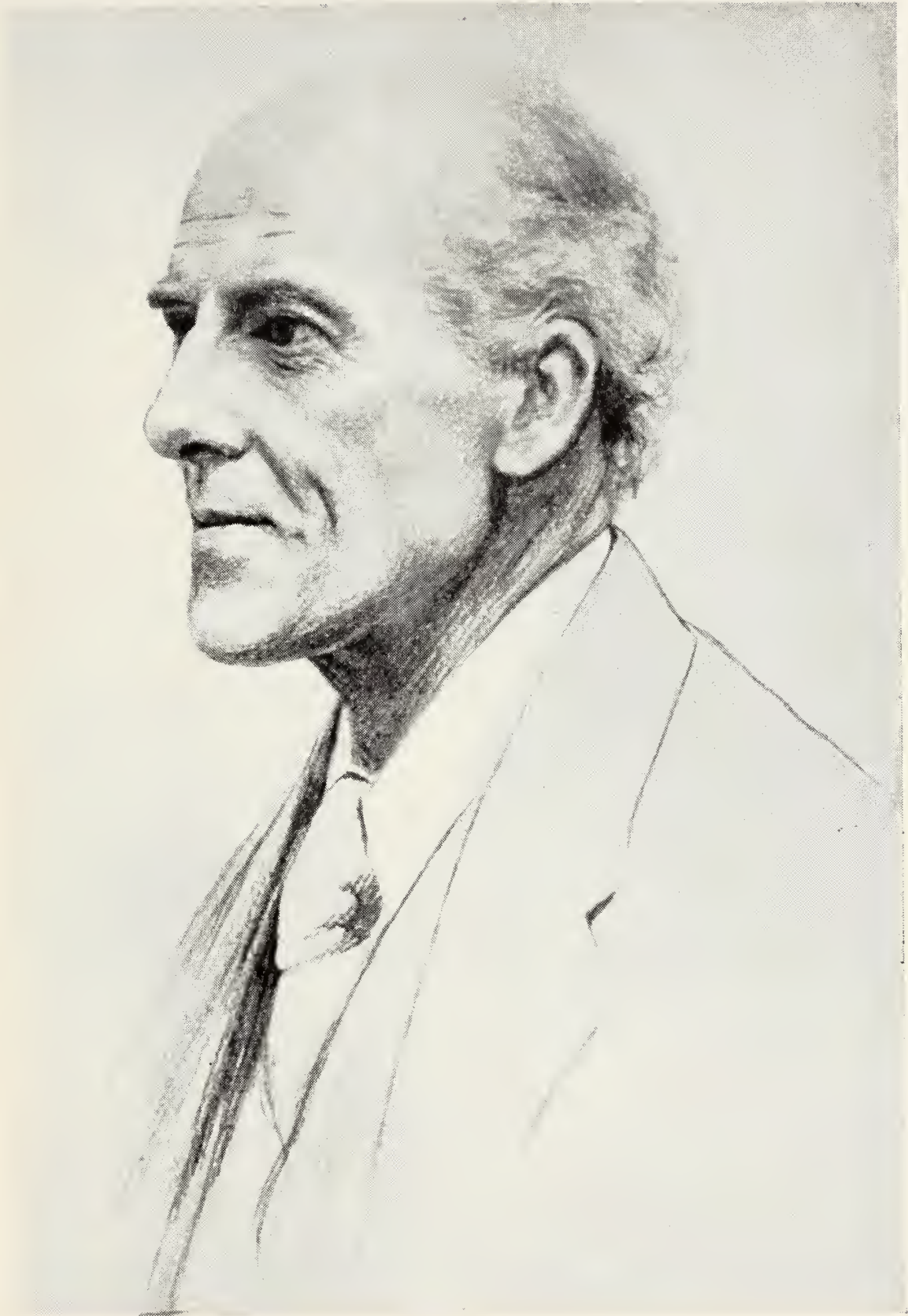




J. NAPIER 1616







K. PEARSON 1924





## PB

- 1a. Oil painting, by an unknown artist, three-quarter length, seated, dated 1616, presented to Edinburgh Univ. by MARGARET, baroness NAPIER, who succeeded in 1686.
- 1b. Reproduced in colors, frontispiece to *Napier Tercentenary Memorial Volume*, Edinburgh, 1915.
- 2a. Oil painting, three-quarter length, seated, dated 1616; up to 1894 never out of the family.
- 2b. Engraved in J. NAPIER, *De Arte Logistica*. Edinburgh, 1839. Engraved by A. H. HODGETTS, from the original then in possession of Lord Napier. See plate (1616).
3. Oil painting, half-length, with cowl, "in possession of Mr. NAPIER of Blackstone."
4. An oil-painting, similar to no. 3, in possession of AYTOUN of Inchdairnie.
5. Oil painting, half-length, without cowl, the history of which is unknown, acquired by LORD NAPIER.
6. Oil painting, half-length, with cowl, "belonging to Professor MACVEY NAPIER," and attributed to the Scottish portrait painter GEORGE JAMESONE (1587-1644).
- 7a. Engraving by FRANCESCO DELARAM, dated 1620, a half-length with ruff, using his "bones." "Published by Charles and Henry Bardwyn, Newgate Street"; copy in the British Museum.
- 7b. Reproduced in E. M. HORSBURGH, *Modern Instruments...*, 1914, oppo. p. 16; and also in H. T. PLEDGE, *Science Since 1500...* London, 1939, portrait plate oppo. p. 51.
- 8a. DAVID STEWART ERSKINE, Earl of BUCHAN & WALTER MINTO, *An Account of the Life Writings and Inventions of John Napier of Merchiston*. Perth, 1787, 139 p. + 5 plates. Portrait frontispiece "engraved from a drawing in the possession of the Earl of BUCHAN"; drawing possibly made from no. 2.
- 8b. Reproduced in E. M. HORSBURGH, *Modern Instruments...*, 1914, oppo. p. 30.
- 9a. R. CHAMBERS, *A Biographical Dictionary of Eminent Scotsmen*, v. 4, Glasgow, 1835. Portrait plate, engraved from no. 1a by S. Freeman, Text, p. 66-70.
- 9b. Reproduced in E. M. HORSBURGH, *Modern Instruments...*, 1914, oppo. p. 1; and (?) in *Enciclopedia Storica delle Scienze e delle loro Applicazioni*, Milan, 1941, v. 1, p. 33.
10. MARK NAPIER, *Memoirs of John Napier of Merchiston, his Lineage, Life, and Times, with a History of the Invention of Logarithms*. Edinburgh and London, 1834. 534 p. + various plates including a frontispiece portrait engraved by Lizars from no. 1a. The locations indicated above for the paintings nos. 2, 3, 4, 5, 6 are as stated in this volume of 1834, p. ix-x.
11. N. L. W. A. GRAVELAAR, *John Napier's Werken*, Akademie van Wetenschappen, Amsterdam, *Verhandelingen*, eerste sectie, v. 6, no. 6, 1899, 159 p. + 3 plates. Portrait reproduction of no. 2a or 2b. This monograph is a very detailed study, in Dutch, of Napier's life and works, in particular of the *Mirifici Logarithmorum Canonis*

*Descriptio*, p. 23–53, with only two pages of the table; and of *Mirifici Logarithmorum Canonis Constructio*, p. 71–109. These are not reprints in Dutch, as Glaisher states in **B** 3, but are very detailed surveys of every step and operation of each work, with full commentary.

12. JAMES L. CAW, *Scottish Portraits*, Edinburgh, v. 1, 1903, p. 60. Reproduction of no. 1a in black and white.
13. ° SOUTH KENSINGTON MUSEUM, *National Historical Portraits*, London, v. 2, n.d. [before 1906], pl. 6.
14. *Modern Instruments and Methods of Calculation. A Handbook of the Napier Tercentenary Exhibition*, edited by E. M. HORSBURGH, etc. London, Bell, and Royal So. Edinburgh, 1914. Three portraits of Napier (see nos. 7b, 8b, 9b above); G. A. GIBSON, "Napier and the invention of logarithms," p. 3–16 (reprinted from R. Phil. So. Glasgow, *Proc.*, v. 45, 1914, p. 35–56) with 2 plates of Merchiston Castle; list of loan exhibits of Napier relics and "Bones"; p. 335, "Engravings of John Napier of Merchiston," including
  - (a)  $5 \times 3$  inches. Engraved by L. Stewart from no. 1a. Publ. by A. Constable & Co., Edinburgh.
  - (b)  $10\frac{1}{4} \times 8\frac{1}{4}$  inches. Engraved by Stewart from no. 1a.
  - (c)  $3\frac{1}{4} \times 5\frac{3}{8}$  inches. Engraved by R. Cooper from no. 7a. Publ. by London, Charles & Henry Baldwin, Newgate St. Copy in the South Kensington Museum, London (see D. BAXANDALL, *Catalogue of the Collection in the Science Museum, Mathematics*, 1926, p. 10; see also p. 11–12).
15. Bust of John Napier in possession of "Lord Napier and Ettrick"; see no. 14, p. 17.
16. E. W. HOBSON, *John Napier and the Invention of Logarithms, 1614. A Lecture*. Cambridge, 1914. 48 p. Portrait frontispiece, probably a copy of no. 10.
17. BALL, v. A., two portraits.
18. P. E. B. JOURDAIN, "John Napier and the tercentenary of the invention of logarithms," *Open Court*, v. 28, 1914, p. 513–520. Portrait as in no. 1a.
19. *Napier Tercentenary Memorial Volume*, ed. by C. G. KNOTT. Publ. by the Royal So. Edinburgh, London, 1915. xii, 442 p. Frontispiece portrait of Napier (see no. 1b), various plates of Merchiston Castle, title-pages, etc., and the following articles:
  - (a) LORD MOULTON, "The invention of logarithms, its genesis and growth," p. 1–32;
  - (b) P. HUME BROWN, "John Napier of Merchiston," p. 33–51; reprinted in P. H. BROWN, *Surveys of Scottish History*. Glasgow, 1917, p. 174–192.
  - (c) GEORGE SMITH, "Merchiston Castle," p. 53–61;
  - (d) F. CAJORI, "Algebra in Napier's Day and alleged prior inventions of logarithms," p. 93–109;
  - (e) G. A. GIBSON, "Napier's logarithms and the change to Briggs's logarithms," p. 111–137;
  - (f) J. E. A. STEGGALL, "A short account of the treatise *De Arte Logistica*," p. 145–161;



- (g) G. VACCA, "The first Napierian logarithm calculated before Napier," p. 163-164;
- (h) G. VACCA, "The theory of Napierian logarithms explained by Pietro Mengoli (1659)," p. 165-167;
- (i) D. M. Y. SOMERVILLE, "Napier's rules and trigonometrically equivalent polygons," p. 169-176.
- 20. D. E. SMITH, *History of Mathematics*, v. 1. Boston, 1923, p. 389-391, portrait, engraved by L. Stewart [nos. 14(a), (b)], p. 389; v. 2, 1925, p. 202, 431, 514, 611, 632.
- 21. SCRIPTA MATHEMATICA, *Portraits of Eminent Mathematicians, with Brief Biographical Sketches*, by D. E. SMITH, New York, 1936. Portrait plate, reproduction of engraving by L. STEWART [nos. 14(a), (b)].
- 22. In the David Eugene Smith Library, at Columbia University, are 15 copies of Napier portraits as follows:
  - (a)  $5\frac{1}{4} \times 7\frac{1}{4}$  inches, engraved by JACQUES REID; (b)  $3\frac{1}{5} \times 5$  inches, publ. by WILLIAM DARTON, London, 58 Holborn Hill;
  - (c) 2 copies of no. 1a; (d) a copy of no. 2; (e) copy of no. 7a;
  - (f) copy of no. 8a by Mr. BROWN; (g) copy of (f); (h) copy of 9a, publ. by Blackie & Son, Glasgow; (i) copy of 14(a), publ. by Constable & Co.; (j) 4 of no. 21.

## B

- 1. POGGENDORFF 2, 1863.
- 2. W. R. MACDONALD, "Napier, John," *Dict. Nat. Biography*, v. 40. London, 1894, p. 59-65.
- 3. J. W. L. GLAISHER, "Napier, John," *Encyclo. Britannica*, eleventh ed., v. 19. London, 1911, p. 171-175; also "Logarithm," v. 16, 1911, p. 868-877.
- 4. H. S. CARSLAW, "The discovery of logarithms by Napier," *Math. Gazette*, v. 8, 1915, p. 76-84, 115-119.
- 5. R. C. ARCHIBALD, "Napier's Descriptio and Constructio," *Amer. Math. So., Bull.*, v. 22, 1916, p. 182-187.
- 6. W. R. THOMAS, "John Napier," *Math. Gazette*, v. 19, 1935, p. 192-205. First sentence: "The main object of this article is to suggest that John Napier took the word 'logarithm,' though not the idea, directly from the Psammites (Arenarius, Sand-Reckoner) of Archimedes."
- 7. K. PEARSON, "On the relation of Henry Briggs to Napier's *Constructio Canonis*" with facsimiles of title pages of *Mirifici Logarithmorum Canonis Constructio*, 1919, and four other pages of the same work, with material written by ROBERT NAPIER and BRIGGS, are given; these are in *Tracts for Computers* no. xx, *Logarithmetica Britannica*, part 7. Cambridge, 1935. Quotations: "It is well known that the earliest published work by Napier on logarithms was his *Mirifici Logarithmorum Canonis Descriptio* issued in 1614. He had, however, prepared an earlier work the *Canonis Constructio* of what Napier then called, not logarithms, but 'artificial' numbers, to distinguish them from 'natural' numbers. Napier died in 1617, and his son, Robert Napier, determined to publish a new edition of the *Descriptio*...our Reproduction IV shows the subtitle to the *Constructio Canonis*, and demonstrates that at the time Napier

wrote the *Constructio*, he had not invented the term 'logarithm.' That must have been added by Briggs or Robert Napier." From this last sentence one might readily make a wrong inference. John Napier alone devised the word *logarithm*, used in Napier's *Descriptio* (1614) and in its English translation (1616).

## T

- 1<sub>1</sub>. *Mirifici Logarithmorum Canonis Descriptio, Ejusque usus, in utraque Trigonometria; ut etiam in omni Logistica Mathematica, Amplissimi, Facillimi, & expeditissimi explicatio. Authore ac Inventore, Ioanne Nepero, Barone Merchistonii &c. Scoto.* Edinburgh, 1614. 57 + 90 p.  $7\frac{1}{2} \times 5\frac{1}{2}$  inches. The first issue of the first edition had p. 14–15 wrongly numbered 22–23. This wrong numbering is also to be found in no. 1<sub>2</sub> (see Quaritch *Catalogue*, no. 336, 1915, p. 2).
- 1<sub>2</sub>. Same as no. 1<sub>1</sub>, except that the last page contains an *Admonitio* expressing an intention of publishing later an improved form of logarithm, which may have referred to a system to base 10, as put more explicitly in no. 1<sub>3</sub>, 1616, and in the dedication of *Rabdologiæ*.
- 1<sub>3</sub>. *A Description Of The Admirable Table of Logarithmes: With A Declaration of The Most Plentifol, Easy, and speedy use thereof in both kindes of Trigonometrie, as also in all Mathematicall calculations. Invented and Pvblished In Latin By That Honorable L Iohn Nepair, Baron of Merchiston, and translated into English by the late learned and famous Mathematician Edward Wright. With an Addition of an Instrumentall Table to finde the part proportionall, inuented by the Translator, and described in the end of the Booke by Henry Briggs Geometry-reader at Gresham-house in London. All perused and approued by the Author, & published since the death of the Translator.* London, 1616.
- 1<sub>4</sub>. Same as in 1<sub>3</sub>, London, 1618, with a slight change and addition to the title, and corresponding to it, following Briggs' account of proportional parts, *An Appendix to the Logarithmes, showing the practise of the Calculation of Triangles, and also a new and ready way for the exact finding out of such lines and Logarithmes as are not precisely to be found in the Canons.* In 1930 the Library of Brown University acquired an excellent facsimile reprint of the title-page of the 1618 edition, followed by the 16 p. of the *Appendix*. There was in it no suggestion as to the publisher or the date of its publication. The Tables in both 1<sub>3</sub> and 1<sub>4</sub> were also published separately.
- 2<sub>1</sub>. *Mirifici Logarithmorum Canonis Constructio; Et eorum ad naturales ipsorum numeros habitudines; Vnà Cvm Appendice, de aliâ eâque praestantiore Logarithmorum specie condenda. Qvibus Accessere Propositiones ad triangula sphaerica faciliore calculo resolvenda: Vnà Cvm Annotationibus aliquot doctissimi D. Henrici Briggii, in eas & memoratam appendicem. Authore & Inventore Ioanne Nepero, Barone Merchistonii, &c. Scoto.* Edinburgh, 1619. 68 p.  $7\frac{1}{2} \times 5\frac{3}{4}$  inches.
- 1<sub>5</sub>&2<sub>2</sub>. *Logarithmorum Canonis Descriptio...* Lyons, 1620, viii, 56 p. *Sequitur Tabula Canonis Logarithmorum seu Arithmeticarum, Supputationum. S'ensuit l'Indice du canon des Logarithmes. A Scavoir,*



*La Table de l'admirable inuention pour promptement & facilement Abreger les supputations, d'Arithmetique avec son usage, en l'une & l'autre Trigonometrie, & aussi en toute Logistique Mathematique.* Lyon, n.d. 92 p.

*Mirifici Logarithmorum Canonis Constructio*, ... Lyons, 1620, 63 p.  $5\frac{1}{4} \times 8$  inches.

These three works, with independent title-pages, were usually bound together and form a fairly correct reprint of the Edinburgh editions. There are some copies of this edition of the *Descriptio* dated 1619. A possible explanation of this may be that the title page was originally set up with the date 1619 but when it was found that the whole work could have not been issued in that year, the date was altered to 1620, and a few copies may have been printed before the alteration.

- 1<sub>6</sub>&2<sub>3</sub>. *Arcanvm Supputationis Arithmeticae: Quo Doctrina & Praxis Sinuum ac Triangulorum mirè abbreviatur. Opus Cuiusvis Omnibus, Geometris præsertim, & Astronomis utilissimum.* Lyons, 1658.

This is not a new edition but the remainder of the edition of 1620 with alterations; see no. 2<sub>4</sub>, below, p. 144.

- 1<sub>7</sub>. Reprint of no. 1<sub>1</sub> in *Scriptores Logarithmici* ed. by F. MASERES, London, v. 6, 1807, p. 475–624. Observations by Francis Maseres, p. 625–710.

- 2<sub>4</sub>. WILLIAM RAE MACDONALD, *The Construction of the Wonderful Canon of Logarithms by John Napier, Baron of Merchiston, Translated from Latin into English with notes, and A Catalogue of the Various Editions of Napier's Works.* Edinburgh and London, 1889. xx, 169 p. Most admirable and valuable work.

- 2<sub>5</sub>. Facsimile reprint of *Mirifici Logarithmorum Canonis Constructio*, as in the edition published at Lyons, 1620. Paris, Librairie Scientifique A. Hermann, 1895.

- 1<sub>8</sub>&2<sub>6</sub>. *The Wonderful Canon of Logarithms or the First Table Of Logarithms with a full description of their ready use and easy application, both in plane and spherical trigonometry, as also in all mathematical calculations. Invented and published by John Napier, Baron of Merchiston, etc., a native of Scotland, A.D. 1614. Re-translated from the Latin text, and enlarged with a table of hyperbolic logarithms to all numbers from 1 to 1201.* By HERSCHELL FILIPOWSKI. Edinburgh, W. H. Lizars, 1857, xx, 72, 112 p.  $5\frac{1}{6} \times 3\frac{4}{6}$  inches. Macdonald notes that "The numbers and logarithms in Table I are those of the Canon of 1614, each divided by 10,000,000, so that the logarithms are strictly to the base  $e^{-1}$ . The Admonitio at the end of the table is wanting. The logarithms in Table II are to the base  $e$ ."

#### NIELS NIELSEN (1865–1931)

B. Oerslev, Fühnen, Denmark. Ph.D. Univ. Copenhagen (1895); prof. math. Univ. Copenhagen (1909–1931); author of many elementary math. textbooks (1892–1908), and of ten volumes dealing with topics of higher mathematics (1907–1931).

## PB

1. H. BOHR, K. Danske Vidensk.-Selsk., Copenhagen, *Overs.*, *Virk-somhed*, 1931-32, 1932, p. 137-145 + portrait plate, 1918.

## B

1. POGGENDORFF 4, 1904; 5, 1926; 6, 1938.
2. N. NIELSEN, *Matematiken i Danmark 1801-1908, Bidrag til en Bibliografisk-historisk Oversigt*. Copenhagen, 1910, p. 85-90, 161.

## T

1. "Recherches sur certaines équations de Lagrange de formes spéciales," K. Danske Vidensk. Selskab, Copenhagen, *Math.-fysiske Meddelel-ser*, v. 5, no. 4, 1923, p. 87-93.
2. "Sur le genre de certaines équations de Lagrange," K. Danske Vidensk. Selskab, Copenhagen, *Math.-fysiske Meddelelser*, v. 5, no. 5, 1923, p. 58-70.
3. "Sur l'opération itérative des équations de Lagrange," K. Danske Vidensk. Selskab, Copenhagen, *Math.-fysiske Meddelelser*, v. 6, no. 1, 1924, p. 85-96.
4. *Tables Numériques des Équations de Lagrange*. Copenhagen and Paris, 1925, xviii, 400 p.
5. *Recherches Numériques sur certaines Formes Quadratiques*. Copenhagen, 1931, xii, 160 p.

## KARL PEARSON (1857-1936)

B. London, England. Educated King's College, Cambridge (1875-1879; B.A. 1879, Math. Tripos third wrangler, LL.B. 1881, M.A. 1882, Fellow 1880-1886, Hon. Fellow 1903); called to the Bar, Inner Temple (1882). First book: *The Trinity. A Nineteenth Century Passion-Play, The Son; or, Victory of Love*. (Cambridge, E. Johnson, 1882. viii, 201 p.). Editor of I. TODHUNTER, *History of the Theory of Elasticity and Strength of Materials* (1886-1893)—he was really the author of considerable portions. Goldsmid prof. applied math., Univ. College, London (1884-1911), Gresham prof. geometry (1891-1911), Galton prof. eugenics and director of the Francis Galton Laboratory of Eugenics (1911-1933), emeritus prof. (1933-1936). Cofounder of *Biometrika* (1900; joint ed. 1900-1906; sole managing ed. 1906-1936). R. Soc. London (Fellow 1896, Darwin Medal 1898). Huxley Lecturer and Medallist of the R. Anthropological Institute (1903); Hon. LL.D. Univ. St. Andrews (1911); Oxford Univ. Weldon Memorial Prize in Biometry offered but refused (1912); Rudolf Virchow Medal of the Anthropological Soc., Berlin (1932, the first foreigner to receive it); Hon. D.Sc., Univ. London (1934); Hon. Fellow R. Soc. Edinb. (1934). Hon. Fellow Anthropological Societies of Paris and U.S.S.R. Editor of *Tracts for Computers*, Nos. I-XX (1919-1935); editor of *Annals of Eugenics*, v. 1-5 (1925-1933).

## PB

1. G. UDNEY YULE, "Karl Pearson 1857-1936," p. 73-104; L. N. G. FILON, "Karl Pearson as an applied mathematician," p. 104-110,



*Obituary Notices of Fellows of the Royal Soc.*, v. 2, no. 5, Dec. 1936. Portrait oppo. p. 73.

- 2<sub>1</sub>. E. S. PEARSON, "Karl Pearson: an appreciation of some aspects of his life and work," *Biometrika*, v. 28, Dec. 1936, p. 193–237 + 3 plates. [Frontispiece: from a pencil drawing made in 1924 by Miss F. A. DE BIDEN FOOTNER; two portraits, 1866 and 1882; two portraits 1890 and 1910]; v. 29, Feb. 1938, p. 161–248 + 4 portrait plates. [Frontispiece: Karl Pearson, 1910; "K. P." caricature from *Union Mag.*, June 1907; marble bust of K. P. (1924) and the artist H. R. HOPE-PINKER; three portraits 1928, 1933, 1935. There is also a double plate facsimile of a letter written by K. P. 16 July 1924]. Bibliography, p. 242–244 in part I, and p. 238–241 in part II.
- 2<sub>2</sub>. Reprinted as a separate volume *Karl Pearson—An Appreciation of Some Aspects of His Life and Work*. Cambridge, Univ. Press, 1938, viii, 170 p. + 9 plates. The Press made for this volume a new block, for Miss Footner's drawing, which is much more satisfactory than the one used in *Biometrika*; see our Plate. Bibl., p. 127–132.

## B

1. C. M. NEALE, *The Senior Wranglers of the University of Cambridge* . . . . Bury St. Edmund's, 1907, p. 47.
2. J. C. MCCABE, *Biog. Dict. of Modern Rationalists*. London, 1920. [Quotation: "His rationalist views are given in his *Ethics of Free-thought* (1887). He is for a concrete religion which places entirely on one side the existence of God and the hope of immortality."]
- °3. *Speeches delivered at a Dinner held in University College, London, in Honor of Professor Karl Pearson, 23 April, 1934*; privately printed. Cambridge Univ. Press, 1934.
4. *Who's Who*, 1936.
5. K. PEARSON, "Old Tripos days at Cambridge as seen from another viewpoint," *Math. Gazette*, v. 20, 1936, p. 27–36.
6. "Karl Pearson 1857–1936," frontispiece, *Biometrika*, v. 28, parts I–II, 1936.
7. G. H. T[HOMSON], *R. Soc. Edinb., Proc.*, v. 56, 1937, p. 274–275.
8. G. U. YULE, "Notes of Karl Pearson's lectures on the theory of statistics 1884–1896," *Biometrika*, v. 30, 1938, p. 198–203.
9. *A Bibliography of the Statistical and Other Writings of Karl Pearson*, compiled by G. M. MORANT, with the assistance of B. L. WELCH. Cambridge, Univ. Press, 1939, viii, 119 p.

## T

In the following list tables sent for publication, but in the compilation of which K. P. had no part, will not, in general (no. 2), be noticed—for example, Legendre's tables of elliptic integrals (1934) and gamma functions (1921), or the tables of JULIA BELL in his paper "On the probable error of a coefficient of correlation as found from a fourfold table" (1913). We have, however, listed the following nos. 6, 11, 14, 16, volumes mainly compiled by K. P., or under his direction, and for which the introductory explanatory material is largely from his pen.

- 1<sub>1</sub>. "Contributions to the mathematical theory of evolution," R. Soc. London, *Trans.*, v. 185A, 1894; table of  $N^p$  for  $p = 2(1)6$ ,  $N = 1(1)30$ , p. 106.
- 1<sub>2-4</sub>. Greatly extended to  $p = 2(1)7$ ,  $N = 1(1)100$  as Table XXVII of *Tables for Statisticians and Biometricians (T.S.B.)*, part I, 1914, p. 38-39. Also in second ed., 1924, and third ed., 1930.
- 1<sub>5</sub>. Extended still further,  $p = 2(1)10$ ,  $N = 1(1)100$  as T. LV of *T.S.B.*, part II, 1931.
2. Pearson's integrals  $G(r, \nu) = \int_0^\pi \sin r\theta e^{\nu\theta} d\theta$ ,  $F(r, \nu) = e^{-\nu\pi/2} G(r, \nu)$ ,  $H(r, \nu) = [(r-1)^{1/2} e^{-\nu\phi} F(r, \nu)] / \cos^{r+1} \phi$ , where  $\nu = r \tan \phi$ , are discussed in a report drawn up by K. P. in B.A.A.S. *Report*, 1896; the Appendix to this report, p. 75-82, consists of "Tables of [auxiliary]  $\chi$ -functions ( $\chi_1$ ,  $\chi_3$ ,  $\chi_5$ , and  $\chi_7$ )," where  $\chi_{2m+1}(\phi) = \frac{B_{2m+1}}{(2m+1)(2m+2)} [(1/2)^{2m+2} - \cos^{2m+1} \phi \cos (2m+1)\phi]$ . These tables were computed by H. F. HARRIS, ALICE LEE, G. U. YULE, C. E. CULLIS, and K. P. Tables of  $\log F(r, \nu)$  and  $\log H(r, \nu)$  by ALICE LEE were published in B.A.A.S. *Report 1899*.
- 3<sub>1</sub>. (with ALICE LEE) "Table of values of  $P$  for values of  $\chi^2$  and  $n$ ," *Phil. Mag.*, s. 5, v. 50, 1900, p. 175.
- 3<sub>2-4</sub>. Greatly elaborated in T. XII of *T.S.B.*, part I, 1914. Also in second ed. 1924, and the third ed. 1930.
- 4<sub>1</sub>. (with ALICE LEE) "Constants of normal curve from moments of tail about stump," *Biometrika*, v. 6, 1908, p. 65, 68.
- 4<sub>2-4</sub>. Reprinted as T. XI of *T.S.B.*, part I, 1914. Also in second ed. 1924, and the third ed. 1930.
- 5<sub>1</sub>. "On a novel method of regarding the association of two variates classed solely in alternate categories," *Drapers' Co. Research Mem., Biometric Series*, VII, 29 p. There are here 6 Tables and 2 Nomograms of which K. P. participated with JULIA BELL in the preparation of 3 T. ("Tables for determining the equiprobable tetrachoric correlation  $rp$ ") and 2N., and K. P. was responsible for one other, "Values of  $(-\log P)$  corresponding to given values of  $\chi^2$  in a fourfold table."
- 5<sub>2-4</sub>. Reprinted as T. XVIII-XXII, XVII of *T.S.B.*, part I, 1914. Also in second ed. 1924, and the third ed. 1930.
- 6<sub>1</sub>. *Tables for Statisticians and Biometricians* [*T.S.B.*, part I], edited by K. P. Cambridge, 1914. lxxxiv, 143 p. LV Tables, mostly reprinted from *Biometrika*.
- 6<sub>2-3</sub>. Second ed., 1924, corrected reprint with the same pagination, and third ed. 1930, a reprint of the second ed.
- 6<sub>4</sub>. In Morant's *Bibliography*: "It is reported that an unauthorized Czech edition of these *Tables* has also been published."
- 7<sub>1</sub>. "Table of values of the constants of the frequency of distribution of the standard deviations of samples drawn at random from a normal population," *Biometrika*, v. 10, 1915, p. 529.
- 7<sub>2</sub>. Reprinted in expanded form, as T. XVIII of *T.S.B.*, part II, 1931.
- 8<sub>1</sub>. (with H. E. SOPER, A. W. YOUNG, B. M. CAVE & ALICE LEE), "On the distribution of the correlation coefficient in small samples. Appendix II to the papers of 'Student' and R. A. Fisher, a cooperative study," *Biometrika*, v. 11, 1917; Tables I-X, A-C, p. 379-413.





K. H. W. KRUSE, L. J. COMRIE, J. T. PETERS 1930



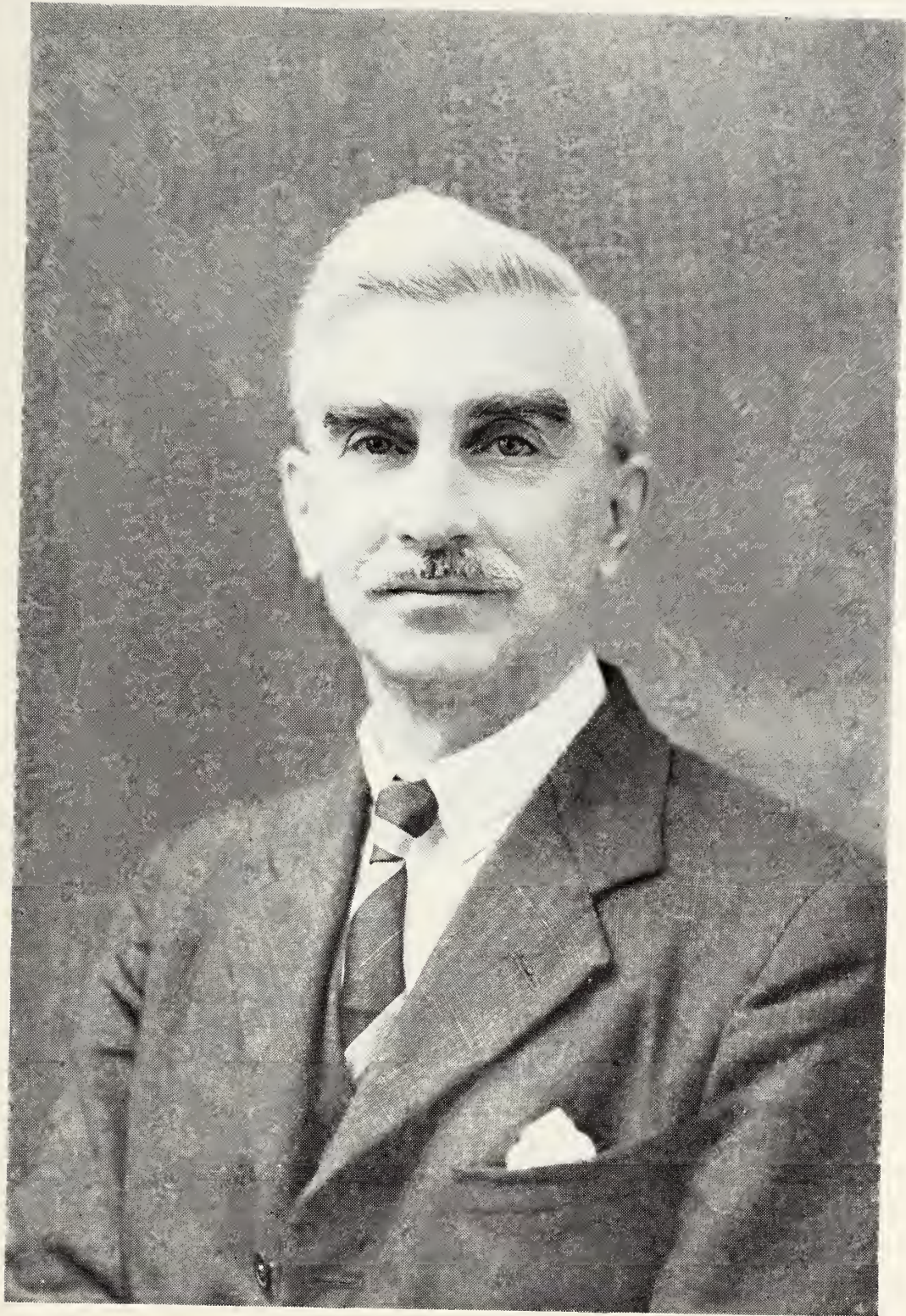




A. H. H. TALLQVIST







A. J. THOMPSON 1947







H. S. UHLER 1941





- 8<sub>2</sub>. Reprinted as T. XXXI<sub>a-f, h</sub>, LI<sub>a-b</sub>, XXVI, XXXII–XXXIV, of *T.S.B.*, part II, 1931.
9. (with A. W. YOUNG) "On the product-moments of various orders of the normal correlation surface of two variates," *Biometrika*, v. 12, 1918; tables p. 90–91.
- 10<sub>1</sub>. (with H. E. SOPER) "Table of ordinates of the normal curve for each permille of frequency," *Biometrika*, v. 13, 1921, p. 428.
- 10<sub>2</sub>. Reprinted as T. I of *T.S.B.*, part II, 1931.
- 11<sub>1</sub>. *Tables of the Incomplete  $\Gamma$ -Function Computed by the Staff of the Department of Applied Statistics . . . University College*. Cambridge, 1922. xxxii, 164 p. Errata slip publ. 1922 (see K. P., *Nature*, v. 110, 1922, p. 669).
- 11<sub>2</sub>. Reissued, 1934.
- 12<sub>1</sub>. "Further contributions to the theory of small samples," *Biometrika*, v. 17, 1925, 4 tables p. 182, 189, 197, 198.
- 12<sub>2</sub>. Reprinted: T. I (corrected), T. II–IV with additions as T. XXVII–XXX of *T.S.B.*, part 2, 1931. A further revision of T. I appeared in *Biometrika*, v. 19, 1927, p. 441.
- 13<sub>1</sub>. (with ETHEL M. ELDERTON) "Values of the differences of the powers of zero," *Biometrika*, v. 17, 1925, p. 200; much enlarged by ETHEL M. ELDERTON and MARGARET MOUL, *Biometrika*, v. 22, 1931, p. 306–308. In 1925, Cayley's table in Cambridge Phil. Soc., *Trans.*, v. 13, 1881, p. 2–3, had been overlooked.
- 13<sub>2</sub>. Reprinted as T. XLIX of *T.S.B.*, part II, 1931.
14. *Tables for Statisticians and Biometricians*, part II, edited by K. P. Cambridge, 1931. ccl, 262 p. Errata slip for part II, 1932 (see *Nature*, v. 130, p. 931). LVI tables mainly reprints, sometimes with corrections and elaborations, from *Biometrika*.
- 15<sub>1</sub>. (with BRENDA STOEISSIGER) "Tables of the probability integrals of symmetrical frequency curves in the case of low powers such as arise in the theory of small samples," *Biometrika*, v. 22, 1931; tables p. 274–283.
- 15<sub>2</sub>. Reprinted as T. XXV, XXV *bis* of *T.S.B.*, part II, 1931.
16. *Tables of the Incomplete Beta Function, Prepared under the direction of and edited by Karl Pearson*. Cambridge, 1934. lix, 494 p.

## BENJAMIN OSGOOD PEIRCE (1854–1914)

B. Beverly, Mass. For 30 years prof. of math. and physics Harvard Univ.; one of the founders of the Amer. Phys. Soc., and its president (1912–13); fellow Nat. Acad. Sci. (1906).

## PB

1. J. TROWBRIDGE, *Harvard Graduates Mag.*, v. 22, Mar. 1914, p. 417–419 + portrait on plate.
2. E. H. HALL, Nat. Acad. Sci., *Biog. Memoirs*, v. 8, 1919, p. 435–466 + portrait plate, with bibl.
3. *Mathematical and Physical Papers 1903–1913 by B. O. Peirce*. Cambridge, Harvard Univ. Press, 1926; portrait frontispiece, and bibliography.



## B

1. POGGENDORFF 3, 1898; 4, 1904; 5, 1926; 6, 1938.
2. *Who's Who in America*, v. 7, 1912–1913. Chicago, 1912; *Who was Who in America*, v. 1. Chicago, 1942.
3. A. G. WEBSTER, *Science*, n.s., Feb. 20, 1914; reprinted in *Nation*, Apr. 23, 1914.
4. R. C. ARCHIBALD, *Dict. Amer. Biog.*, v. 14. New York, 1934, p. 397–398.

## T

1. *A Short Table of Integrals*, Boston, Ginn, 1889, 32 p. (Also bound in with W. E. Byerly's *Elements of the Integral Calculus*, second ed. rev. and enl. 1889.)  
Revised editions: 1899, 135 p.; 1910, 144 p.; 1929, third rev. ed. by W. F. Osgood, ii, 156 p.
- 2<sub>1</sub>. (with ROBERT WHEELER WILLSON, 1853–1922) "Table of the first forty roots of the Bessel equation  $J_0(x) = 0$  with the corresponding values of  $J_1(x)$ ," Amer. Math. So., *Bull.*, v. 3, 1897, p. 153–155. There is a portrait and biographical notice of Willson in *Pop. Astr.*, v. 31, 1923, p. 308–313. Tables of  $x_s$  to 10D;  $\log x_s$  to 10D;  $J_1(x_s)$  to 8D;  $\log J_1(x_s)$  to 7D.
- 2<sub>2</sub>. A. GRAY & G. B. MATHEWS, *A Treatise on Bessel Functions...*, ed. by T. M. MACROBERT, London, 1922, table III, p. 300;  $x_s$  and  $J_1(x_s)$ ,  $s = 11(1)40$ .
- 2<sub>3–4</sub>. Also abridgements by AIREY and WATSON; see *MTAC*, v. 1 p. 308.
3. Am. Acad. Arts Sci., *Proc.*, v. 41, 1906, p. 513–521; v. 43, 1907, p. 173–180; v. 46, 1911, p. 578.  
Also in *Math. Phys. Papers*, 1926, p. 59–66, 172–179, 360–361. Tables of Bessel functions.

## JOHANN THEODOR PETERS (1869–1941)

B. Cologne, Germany. Ph.D. Univ. Bonn (1895); on the staff of the Astronomisches Rechen-Institut, in Berlin-Dahlem (1899–1937); principally responsible for the *Berliner Astronomisches Jahrbuch*, and *Nautisches Jahrbuch*; author of many published astronomical tables and of a number of unpublished mathematical tables; perhaps the greatest mathematical table maker of all time.

## PB

1. *Porträtgalerie* 1931.
2. See Plate, group picture of Peters, L. J. Comrie, and K. H. W. Kruse, of the Hamburg Observatory, taken in 1930, on Lake Balaton, Hungary.

## B

1. *Kürschners Deutscher Gelehrten-Kalender* 1931, fourth ed., Berlin and Leipzig.
2. POGGENDORFF 6, 1938.
3. W. R. A. KLOSE, *Z. angew. Math.*, v. 22, 1942, p. 120.
4. *MTAC*, v. 1, 1944, p. 168–169.

## T

- 1<sub>1</sub>. *Neue Rechentafeln für Multiplikation und Division mit allen ein- bis vierstelligen Zahlen.* [Also English title page.] *New Calculating Tables for Multiplication and Division by all numbers of from one to four places.* Berlin, Reimer, 1909, vi, 500 p.
- 1<sub>2</sub>. ° Third ed. Berlin and Leipzig, de Gruyter, 1924, 500 p.
- 1<sub>3</sub>. Also French ed.: *Nouvelles Tables de Calcul pour la Multiplication et la Division de tous les Nombres de un à quatre Chiffres*, Berlin-Leipzig, 1909, vi, 500 p.
- 1<sub>4</sub>. Also French ed. reprint, second ed, 1919. (In Harvard College Observatory Library.)
- 2<sub>1</sub>. (with J. BAUSCHINGER) *Logarithmisch-trigonometrische Tafeln mit acht Dezimalstellen enthaltend die Logarithmen aller Zahlen von 1 bis 200 000 und die Logarithmen der trigonometrischen Funktionen für jede Sexagesimalsekunde des Quadranten*, Leipzig, Engelmann, 2 v., 1910–1911, xx, 368 p. + 954 p.  
Also copies with title-pages in English.
- 2<sub>2</sub>. ° Second ed. rev., 1936.
- 3<sub>1</sub>. "Einundzwanzigstellige Werte der Funktionen Sinus und Cosinus zur genauen Berechnung von zwanzigstelligen Werten sämtlicher trigonometrischen Funktionen eines beliebigen Arguments sowie ihrer Logarithmen," Akad. d. Wissen., Berlin, *math.-phys. Kl., Abh.*, 1911, *Anhang*, 54 p.
- 3<sub>2</sub>. Also as reprint.
4. *Siebenstellige Logarithmentafel der trigonometrischen Funktionen für jede Bogensekunde des Quadranten.* Leipzig, Engelmann, 1911, xv, 922 p. Title-page also in English.
5. *Fünfstellige Logarithmentafel der trigonometrischen Funktionen für jede Zeitsekunde des Quadranten*, Berlin, Reimer, 1912. iv, 83 p.
- 6<sub>1</sub>. (with G. STRACKE) *Tafeln zur Berechnung der Mittelpunktsgleichung und des Radiusvektors in elliptischen Bahnen für Exzentrizitätswinkel von 0° bis 26°.* Berlin, Astron. Rechen-Institut, *Veröffentlichungen*, no. 41, 1912, 100 p.
- 6<sub>2</sub>. Second ed. enl., Berlin, Dümmler, 1933, 108 p.
7. *Dreistellige Tafeln für logarithmisches und numerisches Rechnen.* Berlin, P. Stankiewicz (later, 1937, Frickert), 1913, 37 p.
- 8<sub>1</sub>. *Siebenstellige Werte der trigonometrischen Funktionen von Tausendstel zu Tausendstel des Grades.* Berlin-Friedenau, Goerz, 1918, vii, 368 p.
- 8<sub>2</sub>. Reprints, Leipzig, Teubner, 1930, and 1938.
- 8<sub>3</sub>. English edition, New York, Van Nostrand, 1942, vi, 368 p.; see *MTAC*, v. 1, p. 12f.
9. (with J. STEIN), *Zweiundfünfzigstellige Logarithmen*, Berlin, Astron. Rechen-Institut, *Veröffentlichungen*, no. 43, 1919, 29 p.
10. *Zehnstellige Logarithmentafel*, 3 v., Berlin, Landesaufnahme, 1922, 1919, 1919, xvi, 607, XXVIII, 195 p. + vii, 902 p. + 71 p. In the first v. was an *Anhang*, prepared with the cooperation of J. STEIN and G. WITT. The third v. contains *Hilfstafeln*.
11. *Sechsstellige Logarithmen der trigonometrischen Funktionen von 0° bis 90° für jedes Tausendstel des Grades.* Berlin, Landesaufnahme, 1921, vi, 920 p.



12. *Siebenstellige Logarithmen der trigonometrischen Funktionen von  $0^\circ$  bis  $90^\circ$  für jedes Tausendstel des Grades.* Berlin, Landesaufnahme, 1921, vi, 920 p.
13. *Tafeln zur Verwandlung von rechtwinkligen Platten-Koordinaten und sphärischen Koordinaten in einander.* Berlin, Astron. Rechen-Institut, *Veröffentlichungen*, no. 47, 1919, viii, 64 p.
14. *Hütte, Hilfstafeln zur I. Verwandlung von echten Brüchen in Dezimalbrüche, II. Zerlegung der Zahlen bis 10 000 in Primfaktoren...*, third ed., Berlin, 1922, 83 p. The tables of this edition were re-computed and checked by J. T. PETERS. See *MTAC*, p. 100, 132.
- 15<sub>1</sub>. *Sechstellige Tafel der trigonometrischen Funktionen enthaltend die Werte der sechs trigonometrischen Funktionen von zehn zu zehn Bogensekunden des in  $90^\circ$  geteilten Quadranten und die Werte der Kotangente und Kosekante für jede Bogensekunde von  $0^\circ 0'$  bis  $1^\circ 20'$ .* Berlin and Bonn, Dümmler, 1929, vi, 293 p.
- 15<sub>2</sub>. ° Second corrected ed. 1939, vi 293 p. See *MTAC*, v. 1, p. 121, 162.
- 15<sub>3</sub>. ° Russian ed.; *Shestiznachnyĕ Tablitsy trigonometricheskikh Funktsiĭ*, Moscow, 1937, 293 p.
- 15<sub>4</sub>. ° Second Russian ed., Moscow, 1938.
- 16<sub>1</sub>. *Sechstellige trigonometrische Tafel für neue Teilung. Die Werte der sechs trigonometrischen Funktionen für jede Minute des in hundert Grade geteilten Quadranten.* Berlin, Wichmann, [1930], vii, 170 p.
- 16<sub>2</sub>. ° Second ed., 1939.
- 16<sub>3</sub>. P. 148–167 were reprinted [1930] with the title *Multiplikations- und Interpolationstafeln für alle ein- bis dreistelligen Zahlen*, Berlin, Wichmann, 23 p.
17. J. BRUNN, *Vierstellige Logarithmen für den Schulgebrauch. Neu herausgegeben und ergänzt von J. PETERS. Ausgabe A: Mit Anhang, "Mathematische Formelsammlung,"* Münster i. W., Aschendorff, 1930, 28, 11 p.
18. BAASMTTC, *Mathematical Tables*, v. 5, *Factor Table, giving the complete decomposition of all numbers less than 100 000, Prepared independently by J. Peters, A. Lodge, E. J. Ternouth, E. Gifford. . .*, London, B.A.A.S., 1935, xvi, 291 p.
19. (with HELENE NOWACKI) *Hilfstafeln zur Verwandlung von Tangentialkoordinaten in Rektaszension und Deklination.* Berlin, Astron. Rechen-Institut, *Veröffentlichungen*, no. 52, 1936, iv, 139 p.
20. *Sechstellige Werte der Kreis- und Evolventen-Funktionen von Hundertstel zu Hundertstel des Grades nebst einigen Hilfstafeln für die Zahnradtechnik*, Berlin and Bonn, Dümmler, 1937, viii, 217 p.
- 21<sub>1</sub>. ° *Sechstellige Werte d. trigonometrischen Funktionen von Tausendstel zu Tausendstel des Neugrades*, Berlin, Wichmann, 1938, vi, 512 p.
- 21<sub>2</sub>. ° Third ed. with corrections, 1940, vi, 512 p.
- 21<sub>3–4</sub>. ° Seventh ed., 1943, 512 p. Ninth ed., 1944, vi, 512 p.
- 22<sub>1</sub>. *Achtstellige Tafel der trigonometrischen Funktionen für jede Sexagesimalsekunde des Quadranten*, Berlin, Landesaufnahme, 1939, xii, 902 p. In collaboration with L. J. Comrie. See *MTAC*, v. 1, p. 11f.
- 22<sub>2</sub>. *Eight-figure Table of the Trigonometrical Functions for Every Sexagesimal Second of the Quadrant.* Photographic reprint, London, War Office, 1939 and 1940. Not available to the general public.

- 22<sub>3</sub>. *Eight-place Table of Trigonometric Functions for Every Sexagesimal Second of the Quadrant*, Ann Arbor, Mich., Edwards Bros., 1943. See *MTAC*, v. 1, p. 147f.
23. *Siebenstellige Logarithmentafel*. Berlin, Laudesaufnahme, 1940, 2 v., vii, 493 p. + vi, 666 p. V. 1: *Logarithmen der Zahlen, Antilogarithmen, Additions- und Subtraktions-logarithmen nebst einem Anhang mit Formeln und Konstanten*. V. 2: *Logarithmen der trigonometrischen Funktionen für jede zehnte Sekunde des Neugrades, log sin and log tg. von 0°.0000 bis 3°.0000, sowie log cos and log ctg von 97°.0000 bis 100°.0000 für jede Sekunde (1° = 0°.0001) des Neugrades*. See *MTAC*, v. 1, p. 143–146.
24. *Siebenstellige Werte d. trigonometrischen Funktionen von Tausendstel zu Tausendstel des Neugrades*. Berlin, Landesaufnahme, 1941, viii, 544p.

## DOMINIQUE FRANÇOIS RIVARD (1697–1778)

B. Neufchateau, Lorraine, France. Taught philosophy and mathematics for many years at Collège de Beauvais in Paris.

## PB

1. BALL v. 6, an engraving  $3\frac{1}{4} \times 5\frac{1}{2}$  ins.

## B

1. ° A. CALMET, *Bibliothèque lorraine ou histoire des hommes illustres*, Nancy, 1751.
2. *Nouvelle Biographie Générale*, v. 42. Paris, 1863.
3. POGGENDORFF 2, 1863.
4. J. HENDERSON, *Bibliotheca Tabularum Mathematicarum*, Cambridge, 1926, p. 81.

## T

- 1<sub>1</sub>. *Tables des Sinus, Tangentes, Secantes, et leur Logarithmes; avec la construction de ces Tables, et les Problèmes de la Trigonométrie Rectiligne & Sphérique*. Paris, 1743; Tables, 288 p. The *Trigonométrie rectiligne et Sphérique avec la construction de ces Tables...* was in a separate volume, Paris, 1743, of which the second ed. appeared in 1747, and a third ed. revised in 1750. I find no basis for Henderson's statements that a third (Poggendorff's statement of fourth may be correct) ed. was published in 1757, or that there was any other French edition of the tables than the one in 1743.
- 1<sub>2</sub>. German edition of the tables, *Tafel der Sinusse, Tangenten und Sekanten, mit ihren Logarithmen, nebst den Logarithmen der natürlichen Zahlen von 1 bis 2000*, Vienna, 1777.

## EDWARD SANG (1805–1890)

B. Kirkcaldy, Scotland. Except for two years (1841–1843) as prof. of mechanical science and of twelve years (1843–1854) spent in Turkey where he assisted in establishing schools of engineering and in laying out railroads, he lived and worked in Edinburgh as a private teacher of mathematics; for many years secretary of the Royal Scottish So. Arts; LL.D. Univ. Edinburgh (1883); hon. mem. Franklin Institute, Philadelphia (1884).



## PB

1. *Modern Instruments and Methods of Calculation*, ed. by E. M. HORSBURGH, 1914, p. 38–47 (reprint of “Dr. Edward Sang’s logarithmic, trigonometrical, and astronomical tables,” R. So. Edinburgh, *Proc.*, v. 28, p. 183–196) + portrait plate.
2. BALL 6, photograph  $2\frac{1}{2} \times 3\frac{3}{4}$  ins., also a copy of this, reproduced in reduced size in no. 1.

## B

1. D. B. PEEBLES, R. So. Edinburgh, *Proc.*, v. 21, 1897, p. xvii–xxxii.
2. C. G. KNOTT, “Edward Sang and his logarithmic calculations,” *Napier Tercentenary Memorial Volume*, London, 1915, p. 261–268; see also R. A. SAMPSON, p. 236–237.
3. *MTAC*, v. 1, 1945, p. 368–370.

## T

1. *Life Assurance and Annuity Tables; with a copious collection of rules and examples*, Edinburgh, 1841, 78, 112 p., folio format; v. 2, London, 1859. The first v. was for one life, and the second “for every combination of two lives.” For the enthusiastic commendation of these volumes by A. DeMorgan see *Engl. Cycl., Arts and Sci. Sect.*, v. 7, 1861, col. 1013.
2. *Tables for the Mutual Conversion of Solar and Sidereal Time*, Edinburgh, 1868, viii, 325 p.
- 3<sub>1</sub>. *A New Table of Seven-Place Logarithms of all numbers from 20 000 to 200 000 . . . , prepared under the auspices of the managers of the Associated Life Insurance Offices in Scotland*. London, 1871, xviii, 365 p.
- 3<sub>2</sub>. Second issue improved, Edinburgh, Elmslie Sang, 1878 (according to J. Henderson).
- 3<sub>3</sub>. Second issue improved. London, Williams & Norgate, 1883, xxiv, 365 p.
- 3<sub>4</sub>. Reprint. London, 1915, from the stereotyped plates belonging to the R. Soc. Edinburgh.
4. *Specimen Pages [4] of a table of the Logarithms of all Numbers up to one Million . . . shortened to nine figures from original calculations to fifteen places of Decimals*, (1874), 26 p.

## ABRAHAM SHARP (1651–1742)

B. near Bradford, Yorkshire, England. Schoolmaster in Liverpool, assistant and friend of Flamsteed at the Greenwich Observatory and later erected his own observatory at his birthplace. Celebrated for skill in graduating instruments.

## PB

1. W. CUDWORTH, *Life and correspondence of Abraham Sharp. The Yorkshire Mathematician and Astronomer, and Assistant of Flamsteed; with Memorials of his Family and Associated Families*. London, 1889. Sumptuously printed volume.
2. BALL, v. 6.

## B

1. C. HUTTON, *A Philosophical and Mathematical Dictionary*: ... new ed., v. 2. London, 1815.
2. H. F. BAKER, *Dict. Nat. Biog.*, v. 51. London, 1897.

## T

- 1<sub>1</sub>. A. SHARP, *Geometry Improved*, London, 1717. In this v. is "A table of areas of the segments of a circle whose whole area is 1,00000,000000,000000" (p. [1]–[55]); and (p. [57]–[64]) log N to 61 D, T.I for N = 1(1)100, for N (prime) < 1100, and T.II for N = 999990(1)1000010, with first ten differences.
- 1<sub>2</sub>. T.I and T.II, revised by W. GARDINER, were reprinted in F. MASERES, *Scriptores Logarithmici*, v. 3, London, 1796, p. 119–125.
- 1<sub>3</sub>. T.I and T.II are also given in the first six editions (1785–1822) of *Mathematical Tables* by C. HUTTON (see above).
- 1<sub>4+</sub>. Also in various editions of F. Callet's *Tables Portatives* (1795–1899), H. M. Parkhurst's *Astronomical Tables* (1871–1889), J. PETERS & J. STEIN, Anhang, p. 156–161 of J. PETERS *Zehnstellige Logarithmentafel*, v. 1, Berlin, 1922, Sherwin's *Mathematical Tables* (1717–1772).

## WILLIAM FLEETWOOD SHEPPARD (1863–1936)

B. Sydney, N.S.W., Australia. Senior wrangler parts I and II B.A. (1884), and of div. 1, pt. III (1885); fellow of Trinity (1887); M.A. (1888), LL.M. (1889), Sc.D. (1908); assist. secy. Board of Education (1914–21); F.R.S.E. (1932); outstanding statistician; author of *From Determinant to Tensor*, Oxford, 1923; 127 p. When SHEPPARD was senior wrangler the third wrangler was afterwards Sir WILLIAM BRAGG and the fourth W. H. YOUNG, later a prominent mathematician.

## PB

1. BAASMTTC, *Mathematical Tables*, v. 7, *The Probability Integral* by W. F. SHEPPARD, completed and edited by the Committee . . ., Cambridge, Univ. Press, 1939. xii, 34 p. "Sheppard's work and other tables" by J. O. IRWIN, p. x–xi. "The Committee, in issuing this volume, believe that the completion and publication of his tables of the probability integral constitute just that memorial to Sheppard's unsurpassed labours in the field of Mathematical Statistics, which he would himself most greatly have appreciated." Portrait frontispiece of Sheppard. See *MTAC*, v. 1, 1943, p. 48f.

## B

1. C. M. NEALE, *The Senior Wranglers of the University of Cambridge* . . ., Bury St. Edmunds, 1907, p. 49.
2. *The Times*, London, Oct. 14, 1936, p. 1c, 19d; G. U. YULE and another, Oct. 17, p. 14b; Oct. 22, p. 11a.
3. A. C. AITKEN & E. T. WHITTAKER, R. So. Edinburgh, *Proc.*, v. 56, 1937, p. 279–282, with bibl.
4. G. U. YULE, *Nature*, v. 138, 1938, p. 872–873.



## T

1. "On the application of the theory of error to cases of normal distribution and normal correlation," R. So. London, *Trans.*, v. 192A, 1899, p. 101-167, tables p. 153-167.
2. "On the relations between Bernoulli's and Euler's numbers," *Quart. J. Math.*, v. 30, 1899, p. 21, 43.
3. "A method for extending the accuracy of certain mathematical tables," London Math. So., *Proc.*, v. 31, 1899, p. 435-439, etc.
4. "Central difference formulae," London Math. So., *Proc.*, v. 31, 1899, p. 436, etc.
- 5<sub>1</sub>. "New tables of the probability integral," *Biometrika*, v. 2, 1903, p. 174-190.
6. "On the accuracy of interpolation by finite differences," London Math. So., *Proc.*, s. 2, v. 4, 1906, p. 331, 338-339, etc., v. 10, 1911, p. 145, 154, 162, 163, etc.
- 7<sub>1</sub>. "Table of the derivate of the normal curve," *Biometrika*, v. 5, 1907, p. 404-406.
- 5<sub>2</sub>, 7<sub>2</sub>. The tables in nos. 5<sub>1</sub> and 7<sub>1</sub> are reprinted (T. I-III) in *Tables for Statisticians and Biometricians*, ed. by K. PEARSON. Part 1, London, 1914, p. xv-xxi, 1-10.
- 5<sub>3</sub>, 7<sub>3</sub>. Second ed., 1924.
- 5<sub>4</sub>, 7<sub>4</sub>. Third ed., 1930.
8. "Extension of accuracy of mathematical tables by improvement of differences," *Napier Tercentenary Memorial Volume*, London, 1915, p. 353-359; illustrative tables occur p. 357-359.
9. The tables listed in PB 1.

## SIMON STEVIN (1548-1620)

B. Bruges, Belgium. Most influential mathematician of the Netherlands in the sixteenth century; published (1582) first table of compound interest, and the first work (1585) to set forth definitely the theory of decimal fractions; notable contributor to the sciences of statics and hydrostatics.

**PB** See also *Addendum*, p. 82, of this book.

1. Portrait painted by an unknown artist, possibly during Stevin's lifetime, in the University Library, Leyden. There is a lithograph of this by J. G. CANNEEL in the Royal Library of Belgium, Brussels. A bust made from this portrait is at Raamstraat 47, The Hague. Information furnished by DIJKSTERHUIS, no. 11 below.
2. In the Royal Library of Belgium, Brussels, a silver medal, 65 mm. in diameter, with a bust of Stevin on one side. It is the work of a Dutch engraver of the seventeenth century. A reproduction of this medal, 61 mm. in diameter, was struck on the occasion of the First National Congress of Science at Brussels in 1930. Information from DIJKSTERHUIS, no. 11.
3. ° J. P. VAN CAPPELLE, *Bijdragen tot de Geschiedenis der Wetenschappen en Letteren in Nederland*, Amsterdam, 1821. A partial reproduction of the painting no. 1. From DIJKSTERHUIS no. 11.

4. In the Royal Library of Belgium, Brussels, a bust of Stevin on a bronze and silver medal made in 1846 by F. DE HONDT, 46 mm. in diameter. From DIJKSTERHUIS, no. 11.
5. Bust in the University Library, Ghent.
6. A "modest but beautiful" monument in memory of Stevin erected in Place Simon Stevin, Bruges, July, 1846. A picture of this Place and monument is given in CHARLES DE FOU, *Promenades dans Bruges*, Liège, n.d., but before 1931.
7. Medal, with a bust of Stevin, 47 mm. in diameter, in the Royal Library of Belgium, Brussels, by A. C. JOUVENEL, dated 1850 (?). From DIJKSTERHUIS, no. 11.
8. *Mathesis*, v. 37, 1923, portrait plate opposite p. 337; a reproduction of no. 1.
9. G. SARTON, "Simon Stevin of Bruges (1548-1620)," *Isis*, v. 21, 1934, p. 241-303; portrait plate opposite p. 244, a reproduction of no. 1.
10. C. M. WALLER ZEPER, *De oudste intresttafels in Italië, Frankrijk en Nederland met een herdruk van Stevins "Tafelen van Interest."* Diss. Leyden, Amsterdam, 1937, 92 p. Portrait plate opposite p. 42, a reproduction of no. 1.
11. C. J. DIJKSTERHUIS, *Simon Stevin*, The Hague, Nijhoff, 1943. xii, 379 p. + 12 plates. The most satisfactory book on Stevin and his work. The portrait frontispiece is by far the best printed reproduction of no. 1. Opposite p. 62 is a reproduction of a picture listed in no. 3. On February 3, 1946, DR. DIJKSTERHUIS informed me that the other portrait on this plate is not of Stevin but of a CORNELIS DREBBEL. The erroneous information as to this portrait of Drebbel being Stevin occurs in J. F. VAN SOMERENS *Beschrijvende Catalogus van Gegraveerde Portretten van Nederlanders*, 3 v., Amsterdam, 1888-1891.

## B

1. POGGENDORFF 2, 1863.
2. M. CANTOR, *Vorlesungen*, v. 2, second ed. 1900, p. 572-578, 614-617, 626-629, etc.
3. H. BOSMANS, "Notes sur *L'Arithmétique* de Simon Stevin," So. Scientifique de Bruxelles, *Annales*, v. 35, 1911, mém., p. 293-313.
4. H. BOSMANS, "Sur quelques exemples de la méthode des limites chez Simon Stevin," So. Scientifique, *Annales*, v. 37, 1913, mém., p. 171-199.
5. H. BOSMANS, "La *Thiende* de Simon Stevin. À propos d'un exemplaire de l'édition originale qui a échappé à l'incendie de la bibliothèque de l'université de Louvain," *Rev. Quest. Scient.*, s. 3, v. 27, 1920, p. 109-139.
6. W. VAN DER WOUDE & P. J. BLOK, *Nieuw Nederlandsch Biografisch Woordenboek*, v. 5. Leyden, 1921.
7. H. BOSMANS, "Remarques sur *L'Arithmétique* de Simon Stevin," *Mathesis*, v. 36, 1922, p. 167-174, 226-231, 275-281.
8. H. BOSMANS, "La résolution des équations du troisième degré d'après Simon Stevin," *Mathesis*, v. 37, 1923, p. 246-254, 304-311, 341-347.
9. H. BOSMANS, *La Thiende de Simon Stevin. Fac-similé de l'édition originale plantinienne de 1585.* Antwerp, 1924, 41, 37 p.



10. H. BOSMANS, "Le mathématicien belge Simon Stevin de Bruges (1548-1620)," *Periodico d. Matem.*, s. 4, v. 6, 1926, p. 231-261.
11. H. BOSMANS, *Biographie Nationale*, v. 23. Brussels, 1924, col. 884-938.
12. G. SARTON, "The first explanation of decimal fractions and measures (1585). Together with a history of the decimal idea and a facsimile (no. XVII) of Stevin's Disme," *Isis*, v. 23, 1935, p. 153-244. See also *MTAC*, v. 1, 1945, p. 400-402.
13. ° M. VAN HAAFTEN, "De oudste geschiedenis der tafels voor samengestelden interest in termijnen," *Verzekeringsbode*, v. 55, 1926, no. 5, p. 25-30.
14. ° M. VAN HAAFTEN, "De zestiende-eeuwsche rentetafels van Stevin, Wentsel en Trenchant," *Verzekeringsarchief*, v. 10, 1929, p. (99)-(114).
15. R.C.A., "Early decimal division of the sexagesimal degree," and "First published compound interest tables, *MTAC*, v. 1, 1945, p. 400-402; v. 2., 1946, p. 91-92.
16. MARIA CLAUDIA ZELLER, *The Development of Trigonometry from Regiomontanus to Pitiscus*. Diss. Michigan, Ann Arbor, 1946, p. 107-108 + plate 40, facsimile of pages of T 2<sub>1</sub>.

## T

- 1<sub>1</sub>. *Tafelen van Interest, Midtsgaders De Constructie der seluer*. Antwerp, 1582. 92 p.
- 1<sub>2</sub>. French translation in Stevin's *La Pratique d'Arithmetique*. Leyden, 1585.
- 1<sub>3</sub>. Another ed. of 1<sub>1</sub>, Amsterdam, 1590.
- 1<sub>4-5</sub>. French translation 1<sub>2</sub>, revised, corrected and enlarged by ALBERT GIRARD (a) Leyden, 1625; (b) Stevin's *Oeuvres Mathematiques*. Leyden, 1634, p. 185-206.
- 1<sub>6</sub>. A facsimile of the original work, given in C. M. WALLER ZEPER, *De oudste intresttafels in Italië, Frankrijk en Nederland met een herdruk van Stevins "Tafelen van Interest,"* Diss. Leyden. Amsterdam, 1937.
- 2<sub>1</sub>. *Hypomnemata Mathematica*, v. 1, *De Cosmographia*. Leyden, 1608, p. 21-139. Trigonometric tables, to every minute in a circle of radius 10 000 000 (7-9s), of sines, tangents, ("Vietae prosinvvm"), and secants, ("Fr. Vietae transsinvosarum"). See under Viète.
- 2<sub>2</sub>. A German translation and arrangement by an unknown author, with a preface, by D. SCHWENTER, *Kurtzer doch gründtlicher Bericht von Caculation der Tabularum Sinuum, Tangentium und Secantium*. Nürnberg, 1628.

## THOMAS JAN STIELTJES (1856-1894)

B. at Zwolle, Holland. Astronomer at the Leiden Observatory (1877-1883); docteur es sciences math. Univ. Paris (1886); chargé de cours and prof. math. Univ. Toulouse (1886-1894).

## PB

1. *Correspondance d'Hermite et de Stieltjes publiée par les soins de B. BAILLAUD et H. BOURGET*, 2 v. Paris, 1905. Portrait plate of Stieltjes in v. 1, also "notice sur Stieltjes" by H. Bourget, p. XI-XX.

2. M. RIESZ, *Acta Mathematica 1882-1912, Table Générale*, Stockholm, 1913, p. 112, 172.
3. *Oeuvres Complètes de Thomas Jan Stieltjes publiées par les soins de la Société Mathématique d'Amsterdam*, 2 v. Groningen, 1914-1918. Portrait frontispiece to v. 1.
4. *Issledovaniia o nepreryvnykh drobiakh* [Researches on continued fractions], Russian translation from the original French, by T. J. Stieltjes, in Toulouse, Univ., Faculté d. Sci., *Annales*, v. 8, 1894, p. 1-122 and v. 9, 1895, p. A1-A47], Kharkov and Kiev, 1936. Portrait frontispiece.

## B

1. E. COSSERAT, "Notice sur les travaux scientifiques de T. J. Stieltjes," Toulouse, Univ., Fac. Sci., *Annales*, v. 9, 1895, p. [1]-[64].
2. POGGENDORFF 3, 1898; 4, 1904; 5, 1926.
3. M. VAN HAAFTEN, *Het Wiskundig Genootschap*. Groningen, 1923, p. 91-92.
4. N. GUNTHER, "Sur les intégrales de Stieltjes et leurs applications aux problèmes de physique mathématique," Akad. Nauk. SSSR, Leningrad, Fiziko-matem. Institut imeni V. A. Steklova, *Trudy*, v. 1, 1932, iv, 494 p.
5. E. J. NYSTRÖM, "Ein Instrument zur Auswertung von Stieltjesintegralen," Soc. Sci. Fennicae, *Commentationes physico-matem.*, v. 9, no. 4, 1936, 18 p.
6. M. VAN HAAFTEN, *Nieuw Nederlandsch Biografisch Woordenboek*, v. 10. Leyden, 1937.

## T

- 1<sub>1</sub>. "Bijdrage tot de theorie der derde- en vierde-machtsresten," Akad. v. Wetensch., Amsterdam, *Verslagen, afd. natuurk.*, sect. 1, s. 2 v. 17, 1882, p. 396-397.
- 1<sub>2</sub>. French transl.: "Contribution à la théorie des résidus cubiques et biquadratiques," *Archives Néerlandaises d. Sci.*, v. 18, 1883, p. 415-416.
- 1<sub>3</sub>. *Oeuvres*, v. 1. Groningen, 1914, p. 192-193, 257-258 (French transl.).
- 2<sub>1</sub>. "Recherches sur quelques séries semi-convergentes," Diss., École Normale Sup., *Annales*, s. 3, v. 3, 1886, table p. 232.
- 2<sub>2</sub>. *Oeuvres*, v. 2, 1918, p. 33.
- 3<sub>1</sub>. "Table des valeurs des sommes  $S_k = \sum_{n=1}^{\infty} n^{-k}$ ," *Acta Math.*, v. 10, 1887, p. 299-302.
- 3<sub>2</sub>. *Oeuvres*, v. 2, 1918, p. 100-103.

AXEL HENRIK HJALMAR TALLQVIST (1870- )

B. Hollola, Finland. At Univ. Helsingfors: Ph.D. (1890), docent math. (1891-1904), docent exper. and mathem. physics (1904-1907), prof. physics (1907-38), emeritus prof. since 1938. During the period 1891-1907, T. was also a junior teacher of mechanics at the Polytechnic Institute until 1899, when he became a senior teacher there.



## P

1. See Plate. For this portrait we are indebted to the courtesy of H. T. DAVIS.

## B

1. *Vem och Vad? Biografisk Handbok 1941*, Helsingfors. Tallqvist's wife was a noted singer; see in this v. under Fohström-Tallqvist, Elin.
2. *MTAC*, 1944, v. 1, p. 118–119; the statement here that T. was appointed professor of mechanics at the Polytechnikum in 1891, is not in accord with information in no. 1. See also *MTAC*, RMT 10, 73, v. 1, p. 4, 8.

## T

1. "Tafeln der Kugelfunctionen  $P_n(x)$  und ihrer abgeleiteten Functionen," Finska Vetenskaps-Societeten, *Acta*, v. 32, no. 6, 1904, 27 p.
2. *Grunderna af Teorin för Sferiska Funktioner jämte Användningar inom Fysiken*, Helsingfors, 1905; tables, p. 384–425.
3. "Tafeln der Kugelfunctionen  $P_n(\cos \theta)$ ," Finska Vetenskaps-Societeten, *Acta*, v. 33, no. 4, 1905, 8 p.
4. "Tafeln der abgeleiteten und zugeordneten Kugelfunctionen erster Art," Finska Vetenskaps-Societeten, *Acta*, v. 33, no. 9, 1906, 67 p. For errors in this table, see *MTAC*, v. 1, p. 122.
5. "Tafeln zur scheinbaren Grösse des Kreises," Finska Vetenskaps-Societeten, *Commentationes Physico-Mathematicae*, v. 5, no. 24, 1931, 36 p.
6. "Tafeln der 24 ersten Kugelfunktionen  $P_n(\cos \theta)$ ," Finska Vetenskaps-Societeten, *Commentationes Physico-Mathematicae*, v. 6, no. 3, 1932, 11 p.
7. "Tafeln der Kugelfunktionen  $P_{25}(\cos \theta)$  bis  $P_{32}(\cos \theta)$ ," Finska Vetenskaps-Societeten, *Commentationes Physico-Mathematicae*, v. 6, no. 10, 1932, 5 p.
8. "Potentialtafeln für die Kreislinie, Kreisfläche und Kreisscheibe," Finska Vetenskaps-Societeten, *Commentationes Physico-Mathematicae*, v. 6, no. 11, 1932, 45 p.
9. "Sechsstellige Tafeln der 16 ersten Kugelfunktionen  $P_n(x)$ ," Finska Vetenskaps-Societeten, *Acta*, s. 2, v. 2A, no. 4, 1937, 43 p.
10. "Sechsstellige Tafeln der 32 ersten Kugelfunktionen  $P_n(\cos \theta)$ ," Finska Vetenskaps-Societeten, *Acta*, s. 2, v. 2A, no. 11, 1938, 43 p.

## ALEXANDER JOHN THOMPSON (1885– )

B. Plaistow, Essex, England. Entered the Civil Service (1905) and after serving in a number of Departments joined the statistical staff of the General Register Office, Somerset House, London (1920). Henceforth engaged in designing and writing official statistical reports on Births, Marriages, and Deaths in and on the Census of England and Wales; retired, 1945. Univ. of London B.Sc. (1911), Ph.D. (1927) for *Logarithmetica Britannica*, parts IX (1924) and VIII (1927). Member of the BAASMTTC since 1929 (vice-chairman, 1938–1947; chairman, March, 1947).

## P

1. See plate (1947).

## B

1. Unpublished mathematical tables listed in FMR, *Index*, 1946, p. 272,  $I_n(x)$ ; p. 274,  $i_n(x) = x^{-n}I_n(x)$ , and  $\log i_n(x)$ ; p. 276,  $M(n + \frac{1}{2}, 2n + 1, x) = 2^{2n}n!e^{x/2} x^{-n}I_n(x/2)$ ; p. 337–338,  $M(\alpha, \gamma, x)$  and  $N(\alpha, \gamma, x)$ .

## T

- 1<sub>1</sub>. *Table of the Coefficients of Everett's Central Difference Interpolation Formula* (*Tracts for Computers*, no. V). Cambridge, Univ. Press, 1921. xvi, 20 p. Edited by K. PEARSON. 16 × 23.2 cm.
- 1<sub>2</sub>. Second ed., Cambridge, 1943, viii, 32 p. Edited by E. S. PEARSON. See *MTAC*, v. 1, p. 185f.
2. *Logarithmetica Britannica, A Standard Table of Logarithms to Twenty Decimal Places*; (*Tracts for Computers*, v. XIX, 1934, Log.  $N$ ,  $N = 10\,000$ – $20\,000$ ; v. XXII, 1947,  $N = 20\,000$ – $30\,000$ ; v. XXI, 1937,  $N = 30\,000$ – $40\,000$ ; v. XVI, 1928,  $N = 40\,000$ – $50\,000$ ; v. XVII, 1931,  $N = 50\,000$ – $60\,000$ ; v. XVIII, 1933,  $N = 60\,000$ – $70\,000$ ; v. XX, 1935,  $N = 70\,000$ – $80\,000$ ; v. XIV, 1927,  $N = 80\,000$ – $90\,000$ ; v. XI, 1924,  $N = 90\,000$ – $100\,000$ ). Cambridge, Univ. Press, Part I, 207 p. + 2 pl.; P. II. ?; P. III, 209 p.; P. IV, 209 p. + 1 plate; P. V, 207 p. + 1 plate; P. VI, 207 p. + 1 plate; P. VII, 211 p.; P. VIII, 209 p.; P. IX, 221 pp. 21.9 × 28 cm.
3. Legendre Polynomials,  $P_{10}(x)$ ,  $P_{11}(x)$  and  $P_{12}(x)$ , BAASMTTC, *Mathematical Tables. Part-volume A, Legendre Polynomials*, Cambridge, Univ. Press, 1946, p. A30–A31. 22 × 28.2 cm. A. J. T. was editor of the Part-volume. See *MTAC*, v. 2, p. 302f.

## HERBERT HALL TURNER (1861–1930)

B. Leeds, England. Second wrangler (1882) and second Smith's prizeman (1883); chief assistant Royal Observatory, Greenwich (1884–1893); Savilian prof. astronomy, Univ. Oxford (1893–1930); F.R.S. (1896); corresp. memb. sect. astronomy, Acad. Sci., Inst. de France (1908); Bruce gold medallist (1927).

## PB

1. Porträtgalerie 1904.
2. R. G. AITKEN, *Astr. So. Pacific, Publications*, v. 42, 1930, p. 277–288 + portrait plate.
3. A. S. CANNON, *Pop. Astr.*, v. 39, 1931, p. 59–66 + portrait plate.
4. R. A. SAMPSON, *R. Soc. London, Proc.*, v. 133A, 1936, p. i–ix + por. pl.

## B

1. POGGENDORFF 4, 1904; 5, 1926.
2. *The Times*, London, 21 Aug. 1930, reprinted in R.A.S. Canada, *J.*, v. 24, 1930, p. 402–405.



3. H. C. PLUMMER, R.A.S., *Mo. Notices*, v. 91, 1931, p. 321-334.
4. R. A. SAMPSON, *Dict. Nat. Biog...1922-1930*. London, 1937.

## T

1. *Tables for facilitating the Use of Harmonic Analysis*. London, Oxford Univ. Press, 1913, 46 p.
2. "On a method of solving spherical triangles, and performing other astronomical computations, by use of a simple table of squares," R.A.S., *Mo. No.*, v. 75, 1915, p. 530-541. Table of 2 versin  $\Delta$ , p. 538-541. See *MTAC*, v. 2, p. 24-25.

## HORACE SCUDDER UHLER (1872- )

B. Baltimore, Md. The Johns Hopkins Univ. B.A. (1894), Ph.D. (1905); Yale Univ. hon. M.A. (1937); director of Physics Laboratory Gettysburg College (1925-26); prof. physics Yale Univ. (1909-1925; 1926-1941); emeritus prof. since 1941.

## PB

1. *Gettysburg College Spectrum for 1927*, Gettysburg, 1926, p. 27.
2. *New Haven Evening Register*, 18 April, 1938, p. 1; article "Have you checking balance woes? Glance at Yale man's problem."
3. *The Sunday Sun*, Baltimore, photogravure section, Apr. 24, 1938, portrait; below the caption, "Something to paste in your hat," it is stated with justification that Dr. Uhler had calculated  $\pi^2$  to 261D.
4. *Yale Alumni Mag.*, v. 3, Apr. 26, 1940, p. 6.
5. See Plate (1941).

## B

1. POGGENDORFF 5, 1926.
2. *Leaders in Education*, second ed., New York and Lancaster, 1941.
3. *The International Blue Book*, ed. H. Ringrose, London, Paris, New York, 1946.
4. *Who's Who in Amer.*, v. 24, 1946-47, Chicago, 1946.
5. *Amer. Men of Science*; seventh ed., Lancaster, Pa., 1944; starred.

## T

1. Eight values, to 54D, of  $e^{\pi/n}$  including  $i^i$ , *Amer. Math. Mo.*, v. 28, 1921, p. 114-116.
2. "A new table of reciprocals of factorials and some derived numbers," Conn. Acad. Arts and Sci., *Trans.*, v. 32, 1937, p. 381-434.
3. "Log  $\pi$  and other basic constants," Nat. Acad. Sci., *Proc.*, v. 24, 1938, p. 23-30. See *MTAC*, v. 1, p. 55.
4. "Recalculation and extension of the modulus and of the logarithms of 2, 3, 5, 7 and 17," Nat. Acad. Sci., *Proc.*, v. 26, 1940, p. 205-212. See *MTAC*, v. 1, p. 56.
5. "The coefficients of Stirling's series for  $\log \Gamma(x)$ ," Nat. Acad. Sci., *Proc.*, v. 28, 1942, p. 59-62. See *MTAC*, v. 1, p. 56.
6. *Original Tables to 137 Decimal Places of Natural Logarithms for Factors of the Form  $1 \pm n \cdot 10^{-p}$ , Enhanced by Auxiliary Tables of Logarithms of Small Integers*, New Haven, Conn., 1942, 120 p. See *MTAC*, v. 1, p. 20.

7. "Natural logarithms of small prime numbers," *Nat. Acad. Sci., Proc.*, v. 29, 1943, p. 319–325. See *MTAC*, p. v. 1, 177.
8. *Exact Values of the First 200 Factorials*, New Haven, Conn., 1944, 24 p. See *MTAC*, v. 1, p. 312. This table has since been extended to the first 300 Factorials, and a photographic copy of the extension has been deposited in the Library of Brown University.

## FRANÇOIS VIÈTE (1540–1603)

Better known in the English-speaking world by his abbreviated Latin name of Vieta (Vietæus). B. Fonteney-le-Comte, West France. He stands out as the greatest mathematician at the close of the sixteenth century. For a time lawyer and member of the local parliament and afterward at the age of 40, master of requests at Paris and member of the king's privy council. Viète wrote that he "did not profess to be a mathematician, but was merely one to whom mathematical studies were delightful in his hours of leisure."

## PB

1. *Galerie Française: ou Collection de Portraits des Hommes et des Femmes... xvi<sup>e</sup>, xvii<sup>e</sup>, et xviii<sup>e</sup> siècles*, Paris, v. 1, 1821, pl. 24.
2. D. E. SMITH, *History of Mathematics*, v. 1, Boston, 1923, p. 310–312.
3. D. E. SMITH, *Portraits of Eminent Mathematicians, with Brief Biographical Sketches*, New York, *Scripta Mathematica*, 1936, separate portrait plate.
4. *Encyclopedia Storica delle Scienze e delle loro Applicazioni*, Milan, v. 1, 1941, p. 33.

## B

1. C. HUTTON, *A Philosophical and Mathematical Dictionary*, new ed., v. 2, London, 1815.
2. A. DEMORGAN, *English Cyclopaedia, Biography*, v. 6, 1858.
3. POGGENDORFF 2, 1863.
4. E. MERLIEUX, *Nouvelle Biographie Générale*, Paris, v. 46, 1866, col. 135–137.
5. J. M. PEIRCE, "References in analytic geometry," *Harvard College, Library Bulletin*, no. 8, 1878, p. 157–158.
6. M. CANTOR, *Vorlesungen*, v. 2, second ed., 1900, p. 590–595, 605–608, 629–641, etc.
7. J. L. F. BERTRAND, "La vie d'un savant au xvi. siècle, François Viète," in his *Éloges Académiques*, nouvelle série, Paris, 1902, p. 143–176.
8. ° F. RITTER, *François Viète*, Paris, 1905, 102 p.
9. ° G. GAMBIER, *Le Mathématicien François Viète*, La Rochelle, 1911.
10. E. T. BELL, *The Development of Mathematics*, second ed., New York, 1945; various index references.

## T

1. *Canon Mathematicus seu ad Triangula Cum Adpendicibus*, Paris, Apud Ioannem Mettayer, 1579. This very rare volume (printed in two colors) includes the first table in which the six trigonometric functions are given completely for every minute (that of Rhæticus in 1551 being to every ten minutes). See also under SIMON STEVIN. Compare C. HUTTON, *Mathematical Tables*, sixth ed., London, 1822,



p. 4-9, also in his *Tracts on Mathem. and Philos. Subjects*, v. 1, 1812, p. 283f; and A. DEMORGAN, article "Table," *English Cyclopaedia, Arts and Science Section*, v. 7, 1861, cols. 864-865. DeMorgan points out that this same work appeared at least twice later with the following titles:

12. ° *Francisci Vietaei opera mathematica in quibus tractatur canon mathematicus, seu ad triangula: item Canonion &c., &c., &c.*, Londini, apud Franciscum Bouvier, 1589.
13. ° (in the British Museum) *Fran. Vietaei Libellorum supplicum in Regia magistri, insignis que Mathematici, varia opera mathematica: in quibus tractatur Canon Mathematicus, seu ad triangula; item Canonion, &c.*, Parisiis, apud Bartholomæum Macæum, &c., 1609.

## ADDENDA

## JOOST BÜRGI

## P

In BENJAMIN BRAMER. *Apollonius Cattus, oder kern der gantzen geometrial*. Marburg, 1684, the frontispiece plate has a portrait of "Jobst Burgius" in the center.

## SIMON STEVIN

## PB

There is a large folding frontispiece portrait of Stevin in *Simon Stevin, Wis- en Natuurkundig Tijdschrift*, v. 25, no. 1, 1947, and p. 1-32 are occupied with a sketch of Stevin by E. J. DIJKSTERHUIS. The plate used in printing the portrait is evidently the same as that used for no. 11. This is the first number of the periodical which is a continuation of three others, including *Christiaan Huygens*.











